

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)
)
Implementation of Section 6002(b) of the Omnibus)
Budget Reconciliation Act of 1993)
)
Annual Report and Analysis of Competitive)
Market Conditions With Respect to Commercial)
Mobile Services)
)

SIXTH REPORT

Adopted: June 20, 2001

Released: July 17, 2001

By the Commission:

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I. INTRODUCTION

A. Overview

In 1993, Congress created the statutory classification of Commercial Mobile Services¹ to promote the consistent regulation of mobile radio services that are similar in nature.² At the same time, Congress established the promotion of competition as a fundamental goal for CMRS policy formation and regulation. To measure progress toward this goal, Congress required the Federal Communications Commission (“Commission”) to submit annual reports that analyze competitive conditions in the industry.³ This report is the sixth of the Commission’s annual reports on the state of CMRS competition.⁴

CMRS includes a large number of terrestrial services and also includes mobile satellite services involving the provision of such service.⁵ As in the past, this report bases its analysis on a consumer-oriented view of wireless services by focusing on specific product categories, regardless of their regulatory classification. In some cases, this includes an analysis of offerings outside the umbrella of “services” specifically designated by the Commission as CMRS.⁶ However, because licensees of these other spectrum-based services often compete with CMRS providers, as well as with other providers of telecommunications services, the Commission believes that it is important to consider them in the analysis.

The structure of this report differs from the structure of the *Fifth Report*⁷ because it focuses on two categories of wireless services: mobile telephony⁸ and mobile data.⁹ This is a departure from the report’s

¹ Commercial Mobile Services came to be known by the Commission as the Commercial Mobile Radio Services, or “CMRS.”

² The Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, Title VI, § 6002(b), amending the Communications Act of 1934 and codified at 47 U.S.C. § 332(c).

³ *Id.* codified at 47 U.S.C. § 332(c)(1)(C).

⁴ This report, like the others before it, discusses CMRS as a whole because Congress called on the Commission to report on “competitive market conditions with respect to commercial mobile services.” 47 U.S.C. § 332 (c)(1)(C). Any individual proceeding in which the Commission defines relevant product and geographic markets, such as an application for approval of a license transfer, may present facts pointing to narrower or broader product markets than any used, suggested, or implied in this report.

⁵ 47 CFR §20.9.

⁶ See, e.g., Section II.A.2.b, Satellite Operators, *infra*, which includes a discussion of satellite services that are regulated as commercial mobile radio services as well as satellite services that may compete with CMRS, even though they are not subject to the CMRS rules.

⁷ Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Fifth Report*, 15 FCC Rcd 17660 (2000) (“*Fifth Report*”). A copy of the *Fifth Report* that includes color versions of the maps may be found on the Commission’s Internet site at <<http://www.fcc.gov/wtb/reports/fc000289.pdf>>.

⁸ This report defines the mobile telephone segment to include the provision of mobile telephony services by cellular, broadband Personal Communications Services (“broadband PCS”), and digital Specialized Mobile Radio (“SMR”) operators.

previous editions, in which there was also a separate section for dispatch services. While traditional dispatch service continues to be provided,¹⁰ there has been an increasing convergence of services provided by dispatch and other mobile telephony providers.¹¹ Moreover, public information regarding dispatch services, as distinct from mobile telephony services, has become more limited. In the *Fifth Report*, public information was available regarding four providers of dispatch services. Two of these providers, Nextel Communications, Inc. (“Nextel”) and Southern LINC, a unit of energy concern Southern Company, offer dual, mobile telephony-dispatch services that straddle the mobile telephony and dispatch sectors. Of the other two major providers of dispatch services discussed in the *Fifth Report*, Chadmoore Wireless Group, Inc. (“Chadmoore”) and Mobex Communications, Inc. (“Mobex”), Nextel has announced plans to acquire Chadmoore and buy Mobex’s SMR licenses.¹² Therefore, for purposes of this report, it is more appropriate to analyze these services as part of the mobile telephony sector.

In addition, we no longer analyze the broadband PCS and cellular sectors separately within the mobile telephony section. As noted above, this report bases its analysis on a consumer-oriented view of wireless services. While some differences remain between analog (traditionally cellular) and digital (traditionally broadband PCS) services, many of the largest operators hold both cellular and broadband PCS licenses, and most use digital technology with both types of licenses. More than 62 percent of all subscribers currently have digital service, and from a consumer’s perspective digital service in the cellular band is virtually identical to digital service in the PCS band.¹³

We emphasize that the two service categories discussed in consumer-oriented terms in this report are not as clearly delineated when viewed from the carriers’ perspective. For example, many mobile telephony operators also offer mobile data services. Therefore, while these service categories are used to provide structure for this CMRS competition report, the Commission’s view of operators is not limited by the categories in which this report places them.

B. Status of Competition

In the year 2000, the CMRS industry continued to experience increased competition and innovation as

⁹ Mobile data service is the delivery of non-voice information to a mobile device and includes everything from paging messages to web access on a mobile phone to e-mail delivery. Participants include both CMRS and non-CMRS providers, many of whom also offer mobile telephony services.

¹⁰ A number of providers continue to provide both commercial and private dispatch services at 800 MHz, 900 MHz, 220 MHz, 217-219 MHz, and 450-470 MHz. See Applications of Motorola, Inc.; Motorola SMR, Inc.; and Motorola Communications and Electronics, Inc. Assignors; and FCI 900, Inc., Assignee; for Consent to Assignment of 900 MHz Specialized Mobile Radio Licenses, *Order*, DA 01-947 (rel. Apr. 17, 2001) (“*Motorola Order*”). Dispatch and SMR are often used interchangeably, although SMR refers to specific spectrum ranges. See Section II.A.1.a(i), Spectrum Allocation, *infra*.

¹¹ See Dan Meyer, *The Winds Of Change: Southern LINC, Nextel Partners Define Their Roles In Market*, RCR RADIO COMMUNICATIONS REPORT, Nov. 13, 2000; and note 47, *infra*. See also, *Motorola Order*, at ¶12. The Wireless Telecommunications Bureau noted in that Order that it recognized ‘the increasing convergence of CMRS services’ and that it “may well adopt a broader market definition in reviewing future transactions.” Nothing in this report should be construed as the Commission taking such action on that market definition.

¹² See Section II.A.1.a(iii)(a), Combinations, Sales, and License Swaps, *infra*.

¹³ See Section II.A.1.c, Continued Rise of Digital, *infra*.

evidenced by lower prices for consumers and increased diversity of service offerings. The process of carriers building nationwide footprints¹⁴ continues to be a significant trend in the mobile telephone sector. The year 2000 saw a number of operators fill in gaps in their coverage through mergers, acquisitions, and license swaps.¹⁵ In parallel with the process of footprint building, mobile telephone operators continue to deploy their networks in an increasing number of markets, expand their digital footprints, and develop innovative pricing plans.

Since the *Fifth Report*, the mobile data sector has continued its transition from paging/messaging to mobile Internet access services. Numerous companies, including paging/messaging carriers, mobile telephone carriers, handheld personal digital assistant (“PDA”) manufacturers, and dedicated data network operators, now offer a myriad of mobile Internet access products on a variety of mobile devices. Since late 1999, seven major mobile telephone operators have begun offering mobile data services, including “wireless web,” Short Messaging Service (“SMS”), and e-mail, on mobile telephone handsets.¹⁶ Four of those seven operators reported mobile Internet usage at the end of 2000 and had a combined total of 2.5 million mobile Internet users.¹⁷ While the number of traditional one-way paging subscribers declined in 2000, the number of advanced messaging subscribers increased as paging/messaging carriers continued to roll out advanced messaging and Internet-based services.¹⁸ In addition, mobile Internet access is currently available on three types of handheld PDA devices.¹⁹

C. Industry Development

Mobile Telephony. Since the release of the *Fifth Report*, the mobile telephony sector of CMRS has experienced another year of strong growth and competitive development.²⁰ In the twelve months ending December 2000, the mobile telephony sector generated over \$52.5 billion in revenues, increased subscribership from 86.0 million to 109.5 million, and produced a nationwide penetration rate of roughly

¹⁴ Generally, “footprint” is an industry term of art referring to the total geographic area in which a wireless provider offers service or is licensed to offer service.

¹⁵ See Section II.A.1.a(iii)(a), Combinations, Sales, and License Swaps, *infra*.

¹⁶ See Section II.B.2.b, Mobile Telephone Operator Offerings, *infra*. Unless otherwise noted, the terms “wireless web” and “mobile web” are used throughout the Introduction and Section II.B, Mobile Data, to mean mobile Internet access via mobile telephone handsets.

¹⁷ *Id.* Because some mobile telephone carriers offer mobile Internet access without a separate subscription beyond voice service, the term “users” is used instead of “subscribers.” Mobile telephone carriers generally define their mobile Internet “users” as customers who have connected to the Internet using their mobile handsets within a certain period of time.

¹⁸ See Section II.B.2.a, Paging/Messaging, *infra*.

¹⁹ See Section II.B.2.c, Handheld Devices, *infra*.

²⁰ All of the data in this report are taken from publicly available sources. These sources include: trade associations, securities analysts, company releases and web sites, filings with the SEC, newspaper and periodical articles, and certain materials made available to the Commission that were prepared by research companies and consultants that study various aspects of the wireless industry. The accuracy of the data from these materials, however, was not independently verified by the Commission. The inclusion of these data in this report does not constitute a representation or warranty by the Commission of their accuracy or completeness.

39 percent.²¹ We note that 39 percent represents an overall average and provides no information on segment-specific growth rates or market penetration by demographic variables (*e.g.*, penetration rates in rural vs. urban areas). Broadband PCS carriers and digital SMR providers continue to deploy their networks.²² To date, 259 million people, or almost 91 percent of the total U.S. population, have access to three or more different operators (cellular, broadband PCS, and/or digital SMR providers) offering mobile telephone service in the counties in which they live.²³ Over 214 million people, or 75 percent of the U.S. population, live in areas with five or more mobile telephone operators competing to offer service.²⁴ And 133 million people, or 47 percent of the population, can choose from at least six different mobile telephone operators.²⁵

The rise of digital technology in the mobile telephone sector continues unabated.²⁶ The combined effect of increasing digital and declining analog customers has been that, at the end of 2000, digital customers made up 62 percent of the industry total, up from 51 percent at the end of 1999 and 30 percent two years ago.²⁷ Finally, in part because of growing competition in the marketplace, it appears that the average price of mobile telephone service has fallen substantially during the year since the *Fifth Report*, continuing the trend of the last several years.²⁸ According to the U.S. Department of Labor Bureau of Labor Statistics, the price of mobile telephone service declined by 12.3 percent during 2000.²⁹ Another analyst estimates that mobile telephone prices fell 25 percent between 1999 and 2000.³⁰

Mobile Data. This report divides current mobile data offerings into four categories: paging/messaging services; mobile telephone Internet access; data services offered over handheld PDA devices with a mobile Internet connection; and mobile data offerings by dedicated data network operators. In addition to these current mobile data offerings, there are a number of mobile data services and technologies in development, including Wireless Application Protocol (“WAP”), location-based services, and m-commerce, which will

²¹ See Appendix C, Table 1, at C-2. The nationwide penetration rate is calculated by dividing total mobile telephone subscribers by the total U.S. population. According to the 2000 Census, the population of the United States on April 1, 2000 was 283.0 million. In 1999, the U.S. population was estimated to be 271.0 million. See *Fifth Report*, at 17663. The 1999 population estimate appears to be lower than what the actual population was at that time. Therefore, a comparison of the 1999 and 2000 penetration rates would make the rate of increase in wireless penetration look lower than it actually was.

²² See Section II.A.1.b(v), Market Entry, *infra*, for a detailed discussion.

²³ See Appendix C, Table 4, at C-5.

²⁴ *Id.*

²⁵ *Id.*

²⁶ The four main digital technologies used in the United States are: Code Division Multiple Access (“CDMA”), Global System Mobile Communications (“GSM”), integrated Digital Enhanced Network (“iDEN”), and Time Division Multiple Access (“TDMA”).

²⁷ See Section II.A.1.c, Continued Rise of Digital, *infra*, for a detailed discussion.

²⁸ See Section II.A.1.d, Pricing Data and Trends, *infra*, for a detailed discussion of price competition.

²⁹ *Id.*

³⁰ *Id.*

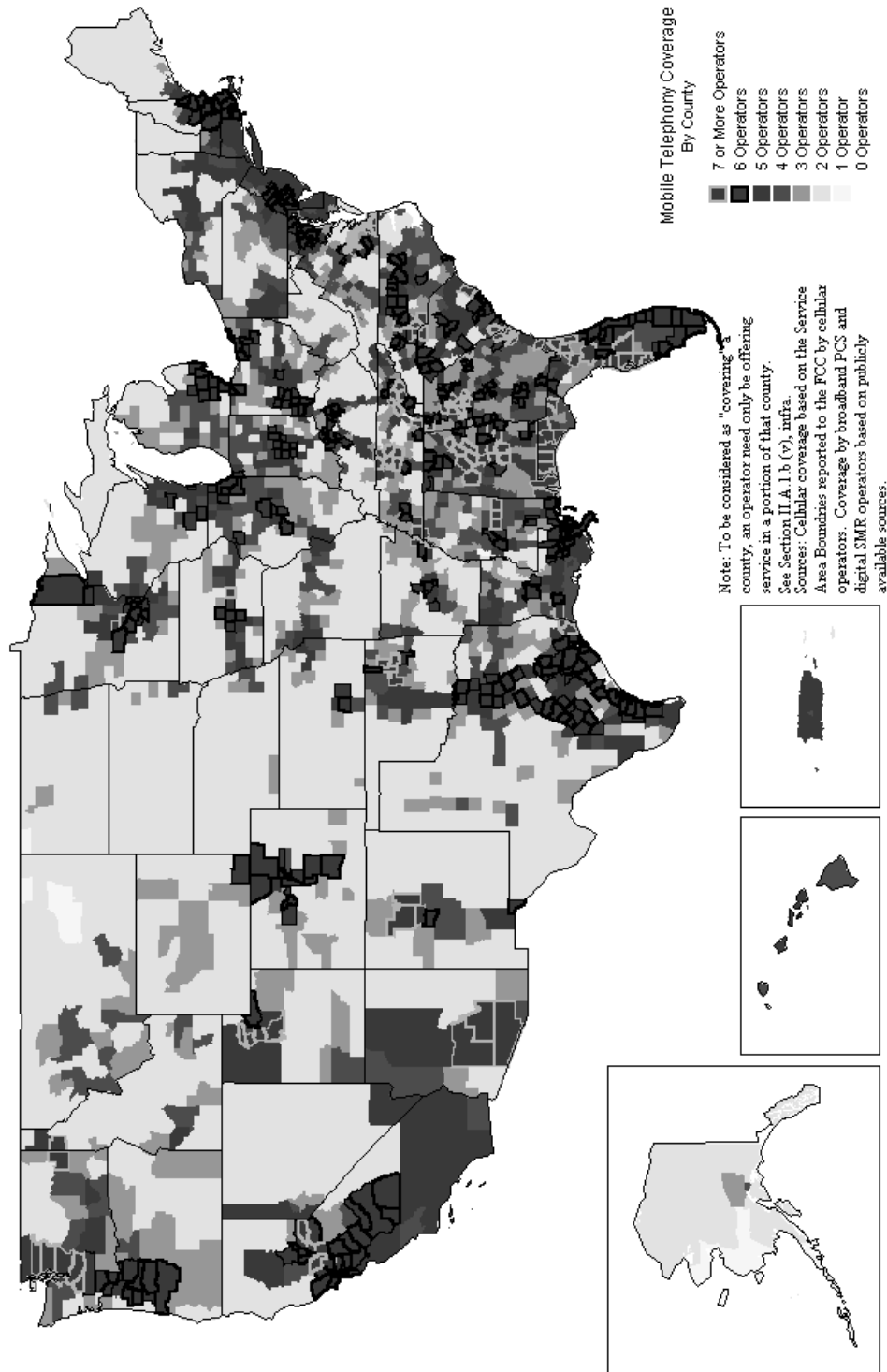
likely play a more prominent role in the mobile data industry as it evolves.³¹ Many analysts expect that the development and deployment of advanced wireless or Third Generation (“3G”) services³² will increase the growth of mobile data services over the next several years. During 2000 and early 2001, several U.S. mobile telephone carriers announced their 3G rollout plans. At least six carriers expect to begin deploying network technologies during late 2001 and early 2002 that will allow for mobile Internet access speeds of up to 144 kbps.³³

³¹ See Section II.B.3, Developing Mobile Data Services, *infra*.

³² 3G generally refers to high-speed advanced mobile services and the technologies that will make such services available. 3G speeds are expected to reach 2 Mbps from a fixed location, 384 kbps at pedestrian speeds, and 144 kbps at traveling speeds of 100 kilometers per hour. See *Fifth Report*, at 17695. “2.5G” refers to the interim technologies that carriers will use while migrating from their current 2G technologies of CDMA, TDMA, GSM, and iDEN to 3G technologies. Some members of the wireless industry label certain technologies as “3G,” while others label the same technology as “2.5G.” Therefore, it is difficult to place the next generation of network technologies into categories, but the 2.5G and 3G technologies include General Packet Radio Service (“GPRS”), Enhanced Data rates for GSM Evolution (“EDGE”), Wideband CDMA (“WCDMA”), cdma2000 1X, cdma2000 1XE, and cdma2000 3XRTT. WCDMA is also known as UMTS (Universal Mobile Telecommunications System). The general migration path for GSM and TDMA carriers is to implement GPRS, then possibly EDGE and eventually WCDMA, while the current CDMA carriers will likely deploy the cdma2000 technologies. See Section II.B.1.c, 3G Developments, *infra*.

³³ See Section II.B.1.c, 3G Developments, *infra*. These carriers include the six nationwide mobile telephone carriers discussed in Section II.A.1.a(iii), Building Nationwide Networks, *infra*.

Mobile Telephone Operator Coverage Estimated by County



II. THE CMRS INDUSTRY

A. Mobile Telephony

This report defines the mobile telephone sector to include all operators that offer commercially available interconnected mobile phone services. These operators provide access to the public switched telephone network ("PSTN") via mobile communication devices employing radiowave technology to transmit calls. As discussed in previous reports,³⁴ providers using cellular radiotelephone, broadband PCS, and SMR licenses dominate this sector.³⁵ Resellers and operators using satellite systems also offer mobile telephone services. Because these licensees offer mobile telephone services that are essentially interchangeable from the perspective of most consumers, they are discussed in this report as a cohesive industry sector.

The discussion below describes the mobile telephone market as a whole and includes sections on market structure, market performance, digital technologies, pricing, and wireless-wireline competition. This is followed by discussions of resellers and satellite providers as well as international developments.

1. Mobile Telephone Overview and Analysis

a. Market Structure

(i) Spectrum Allocation

Mobile telephony operators primarily use three types of spectrum licenses to provide service: cellular, broadband PCS, and SMR.

Cellular - The Commission began licensing commercial cellular providers in 1981 and completed licensing the majority of operators by 1992. The Commission divided the United States and its possessions into 734 cellular market areas ("CMAs"), including 305 Metropolitan Statistical Areas ("MSAs"), 428 Rural Service Areas ("RSAs"), and a market for the Gulf of Mexico. Two cellular systems were licensed in each market area. The Commission allocated 50 megahertz of spectrum in the 800 MHz frequency band for the two competing cellular systems in each market (25 megahertz for each system).

Broadband PCS - Broadband PCS is similar to cellular service, except that broadband PCS systems operate in different spectrum bands and are designed to use a digital format. Broadband PCS licenses have been assigned through auction, beginning in 1995.³⁶ The most recent broadband PCS auction was

³⁴ See Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Fourth Report*, 14 FCC Rcd 10145 (1999) ("*Fourth Report*"), at 10151-10152, and *Fifth Report*, at 17668.

³⁵ As codified at 47 C.F.R. §§ 22.900, 24.200, 90.601.

³⁶ The first auction was for two license blocks of 30 megahertz each. *FCC Grants 99 Licenses For Broadband Personal Communications Services In Major Trading Areas*, News Release, Federal Communications Commission, June 23, 1995. The Commission has had five additional broadband PCS auctions. See Federal Communications Commission, *Completed Auctions* (visited Apr. 13, 2001) <<http://www.fcc.gov/wtb/auctions/serv8.html>>. Three licenses were also awarded as part of a pioneer preference program in 1994. *Three Pioneer Preference PCS Applications Granted*, News Release, Federal Communications Commission, Dec. 14, 1994.

completed in 2001.³⁷ The Commission has set aside the spectrum between 1850 MHz and 1990 MHz for broadband PCS. This spectrum includes 120 megahertz for mobile telephony, divided originally into three blocks of 30 megahertz each (blocks A, B, and C) and three blocks of 10 megahertz each (blocks D, E, and F).³⁸ Two of the 30 megahertz blocks (A and B blocks) are assigned on the basis of 51 Major Trading Areas (“MTAs”).³⁹ One of the 30 megahertz blocks (C block) and all three of the 10 megahertz blocks are assigned on the basis of 493 BTAs.⁴⁰

SMR - The Commission first established SMR in 1979 to provide for land mobile communications on a commercial basis. The Commission initially licensed spectrum in the 800 and 900 MHz bands for this service, in non-contiguous bands, on a site-by-site basis.⁴¹ The Commission has since licensed additional SMR spectrum through auctions,⁴² so that there are at least 26.5 megahertz of spectrum available for SMR services.⁴³ While Commission policy permits flexible use of this spectrum, including the provision of

³⁷ See Section II.A.1.a(iv), Auction No. 35, *infra*.

³⁸ The Commission’s broadband PCS allocation includes 20 megahertz of spectrum at 1910 MHz - 1930 MHz for unlicensed broadband PCS. Unlicensed broadband PCS is used for short-range communications such as local area networks in offices. Such systems operate with very low power and have a limit on the duration of transmissions.

³⁹ Major Trading Areas are Material Copyright (c) 1992 Rand McNally & Company. Rights granted pursuant to a license from Rand McNally & Company through an arrangement with the Federal Communications Commission. Rand McNally’s MTA specification contains 47 geographic areas covering the 50 states and the District of Columbia. For its spectrum auctions, the Commission has added three MTA-like areas: Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa. In addition, Alaska was separated from the Seattle MTA into its own MTA-like area. MTAs are combinations of two or more Basic Trading Areas (“BTAs”). BTAs are Material Copyright (c) 1992 Rand McNally & Company. Rights granted pursuant to a license from Rand McNally & Company through an arrangement with the Federal Communications Commission. BTAs are geographic areas drawn based on the counties in which residents of a given BTA make the bulk of their shopping goods purchases. Rand McNally’s BTA specification contains 487 geographic areas covering the 50 states and the District of Columbia. For its spectrum auctions, the Commission added additional BTA-like areas for: American Samoa; Guam; Northern Mariana Islands; San Juan, Puerto Rico; Mayagüez/Aguadilla-Ponce, Puerto Rico; and the U.S. Virgin Islands.

⁴⁰ In June 1998, broadband PCS C block licensees were permitted to elect to disaggregate their licenses and return 15 megahertz of C block spectrum to the Commission. As a result, a number of licensees elected to disaggregate some or all of their licenses, creating some BTAs with seven broadband PCS spectrum licenses. See Amendment of the Commission’s Rules Regarding Installment Payment Financing for Personal Communications Services (PCS) Licensees, *Second Report and Order and Further Notice of Proposed Rule Making*, 12 FCC Rcd 16436 (1997); Amendment of the Commission’s Rules Regarding Installment Payment Financing for Personal Communications Services (PCS) Licensees, *Order on Reconsideration of the Second Report and Order*, 13 FCC Rcd 8345 (1998). See also Section II.A.1.a(iv), Auction No. 35, *infra*, for additional recent changes.

⁴¹ The “900 MHz” SMR band refers to spectrum allocated in the 896-901 and 935-940 MHz bands; the “800 MHz” band refers to spectrum allocated in the 806-824 and 851-869 MHz bands. See 47 C.F.R. §90.603; see also 47 C.F.R. § 90.7 (defining “specialized mobile radio system”).

⁴² The Commission has had four auctions for SMR licenses. Federal Communications Commission, *Completed Auctions* (visited Apr. 4, 2001) <<http://www.fcc.gov/wtb/auctions/serv8.html#completed>>.

⁴³ Five megahertz in the 900 MHz band (200 paired channels x 12.5 kHz/channel). See 47 C.F.R. §90.617, Table 4B. 21.5 megahertz in the 800 MHz band: 14 megahertz in the 800 SMR Service (280 paired channels x 25

paging, dispatch, mobile voice, mobile data, facsimile, or combinations of these services,⁴⁴ the primary use for SMR traditionally has been dispatch services.⁴⁵ Dispatch differs from mobile voice communications offered by PCS and cellular carriers in that it allows both one-to-one and one-to-many communication (including real-time conferencing with groups), and it generally does not operate through interconnection with the public switched telephone network.⁴⁶ SMR systems have also had the ability to offer interconnected service, but until the development of digital technologies, analog SMR systems had very limited capacity to provide mobile telephony. In recent years, however, the nature of SMR service has evolved significantly. SMR providers such as Nextel and Southern LINC have used digital technologies to increase spectral efficiency and become more significant competitors in mobile telephony, while also providing dispatch functionality as part of their service offerings.⁴⁷ At the same time, traditional dispatch services are being provided increasingly on non-SMR spectrum bands.⁴⁸ Furthermore, in apparent response to the dispatch functionality of SMR services, cellular and PCS carriers have recently begun to offer dispatch-like options (e.g., group calling and conferencing) as part of their service offerings, particularly for businesses.⁴⁹

kHz/channel) and 7.5 megahertz in the 800 MHz General Category (150 paired channels x 25 kHz/channel). See 47 C.F.R. §90.615, Table 1 (SMR General Category) and 47 C.F.R. §90.617, Table 4A (SMR Service). The Commission has also recently amended its rules to allow Business and Industrial/Land Transportation licensees in the 800 MHz band to use their spectrum for CMRS operations under certain conditions. Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies; Establishment of Public Service Radio Pool in the Private Mobile Frequencies Below 800 MHz; Petition for Rule Making of The American Mobile Telecommunications Association, *Report and Order and Further Notice of Proposed Rule Making*, FCC 00-403 (rel. Nov. 20, 2000), at ¶¶ 110-111. This could make up to five megahertz of additional spectrum available for digital SMR providers: 2.5 megahertz in the Industrial/Land Transportation Category (50 paired channels x 25 kHz/channel) and 2.5 megahertz in the Business Category (50 paired channels x 25 kHz/channel). See 47 C.F.R. §90.617, Tables 2A and 3A.

⁴⁴ *Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium*, Policy Statement, 14 FCC Rcd 19868 (1999); see also Applications of Various Subsidiaries and Affiliates of Geotek Communications, Inc. and FCI 900, Inc., *Memorandum Opinion and Order*, 15 FCC Rcd 790 (2000), at ¶ 25.

⁴⁵ Dispatch services allow two-way, real-time, voice communications between fixed units and mobile units (e.g., between a taxicab dispatch office and a taxi) or between two or more mobile units (e.g., between a car and a truck). See *Fifth Report*, at 17727-17728, for a detailed discussion.

⁴⁶ See The Strategis Group, *THE STATE OF THE SMR INDUSTRY: NEXTEL AND DISPATCH COMMUNICATIONS* (Sept. 2000), at 57; The Strategis Group, *U.S. DISPATCH MARKETS* (Jan. 2000) at 1. See also *Motorola Order*, at ¶ 13.

⁴⁷ According to Nextel, “[We are] referred to as an ‘SMR provider’ . . . , although [our] services compete directly with and are regulated virtually identically to those of cellular and PCS providers.” Nextel, *Automatic and Manual Roaming Obligations Pertaining to Commercial Mobile Radio Services*, *Comments*, WT Docket No. 00-193, at note 4. However, in comparison with cellular and broadband PCS providers, digital SMR providers are more focused on the business than the individual consumer market. See, e.g., Nextel Communications, Inc., SEC Form 10-Q, Nov. 14, 2000, at 16.

⁴⁸ “Trunked” dispatch, which refers to dispatch offered on systems allowing automatic sharing of multiple radio channels, is available on spectrum allocated in the 217-219, 220-222, and 450-470 MHz frequency bands. See *Motorola Order*, at ¶¶ 18-20 for a detailed discussion.

⁴⁹ *Id.*, at ¶ 22.

Spectrum Cap - In every geographical area, the Commission has authorized at least eight different mobile telephony licensees (two cellular and six broadband PCS), not including additional digital SMR licensees.⁵⁰

Moreover, under Commission rules, broadband PCS, cellular, and auctioned SMR licensees may disaggregate (divide the spectrum into smaller amounts of bandwidth) or partition (divide the license into smaller geographical areas) their licenses, or both, to other entities.⁵¹ Many licensees have more than one license in a particular market. However, under the Commission's CMRS spectrum cap (which applies to 180 MHz of spectrum), no entity may control more than 45 megahertz of cellular,⁵² broadband PCS, and SMR⁵³ spectrum in an urban market, or more than 55 megahertz in a rural market.⁵⁴ Therefore, the spectrum cap ensures that there are at least four different licensees in every market, and as a practical matter, there are generally five or more licensees in every market.

(ii) Convergence of Cellular and PCS

Cellular and PCS networks use the same basic design. Both use a series of low-power transmitters to serve relatively small areas ("cells"), and both employ frequency reuse to maximize spectrum efficiency.⁵⁵ In the past, the primary difference was that cellular networks used an analog technology, while PCS networks were designed from the start to use a digital format. Digital technology provides better sound quality and increases spectral efficiency in comparison to analog technology. Increased capacity on digital networks has in turn permitted companies to offer calling plans with large buckets of relatively inexpensive minutes, free enhanced services such as voicemail and caller ID, and wireless data and mobile Internet offerings.⁵⁶

⁵⁰ Some markets may have fewer licensees because certain auction winners have defaulted on payments to the Commission, because some licensees returned their licenses, or because some licenses went unsold in auction.

⁵¹ 47 CFR § 24.714 (PCS); 47 CFR § 22.948 (cellular); 47 CFR § 22.948; 47 CFR § 90.813, § 90.911 (auctioned SMR).

⁵² In addition, the Commission's rules limit an entity from having cross-interests in cellular licenses on both blocks within a geographic area. 47 CFR § 22.942.

⁵³ No more than 10 megahertz of SMR spectrum is attributable to an entity under the cap. 47 CFR § 20.6(b).

⁵⁴ 47 CFR § 20.6(a). The Commission is currently reviewing whether it should alter its spectrum cap rules. 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, *Notice of Proposed Rulemaking*, WT Docket No. 01-14 (rel. Jan 23, 2001).

⁵⁵ PCS and cellular networks are both "cellular" systems, since both divide service regions into many small areas called "cells." Cells can be as small as an individual building or as big as 20 miles across, or any size in between. Each cell is equipped with its own radio transmitter/receiver antenna. Service regions are divided into cells so that individual radio frequencies may be used over and over again in different cells ("frequency reuse"), allowing for more calls in the system. When a person makes a call on a wireless phone, the message is transmitted to the nearest antenna, which connects with the local phone network. When a person is using a wireless phone and approaches the boundary of one cell, the wireless network senses that the signal is becoming weak and automatically hands off the call to the antenna in the next cell. US Unwired, *About Cellular* (visited Mar. 8, 2001) <<http://www.usunwired.com/wireless/cellular/cellular.cfm>>. SMR and cellular/broadband PCS convergence is not discussed here because no mobile telephony operator uses cellular or broadband PCS spectrum in addition to SMR spectrum.

⁵⁶ Dan Meyer, *Analog Service Not Fading Away*, RCR WIRELESS NEWS, Jan 18, 2001, at 18; see also Verizon Wireless, Inc., SEC Form S-1, Aug. 24, 2000, at 84. See Section II.B, Mobile Data, *infra*.

Four of the largest mobile telephony companies - AT&T Wireless Group ("AT&T Wireless"), Verizon Wireless, LLC ("Verizon Wireless"),⁵⁷ Cingular Wireless, LLC ("Cingular Wireless")⁵⁸ and ALLTEL Corp. ("ALLTEL") - hold both cellular and broadband PCS licenses, and these carriers have deployed digital technology extensively throughout their cellular networks.⁵⁹ Even operators with only cellular licenses, such as United States Cellular Corp. ("US Cellular"), are well along in the conversion of their analog networks to digital. Several manufacturers produce dual and tri-mode handsets for operators with both analog and digital networks, allowing customers to move between digital and analog areas with ease.⁶⁰ More than 62 percent of all mobile telephony subscribers use digital service now, and from a customer's perspective digital service in the cellular band is virtually identical to digital service in the PCS band.

(iii) Building Nationwide Networks

In the United States, there are six nationwide mobile telephony operators: AT&T Wireless, Sprint PCS,⁶¹ Verizon Wireless, VoiceStream Wireless Corp. ("VoiceStream"), Cingular Wireless, and Nextel. In comparison, there were three nationwide mobile telephony operators at the end of 1999.⁶² In addition to the nationwide operators, there are a number of large regional players, including Western Wireless Corp. ("Western Wireless"), US Cellular, Dobson Communications Corp. ("Dobson"), and ALLTEL.

The Commission has concluded previously that operators with larger footprints can achieve certain economies of scale and increased efficiencies compared to operators with smaller footprints.⁶³ Such benefits, along with advances such as digital technology, have permitted companies to introduce and expand innovative pricing plans such as digital-one-rate ("DOR") type plans,⁶⁴ reducing prices to

⁵⁷ Verizon Wireless is a joint venture of Verizon Communications, Inc. ("Verizon") and Vodafone Group PLC ("Vodafone"). Verizon owns 55 percent of Verizon Wireless, and Vodafone owns 45 percent.

⁵⁸ Cingular Wireless is a subsidiary of Cingular, LLC ("Cingular"), a joint venture of SBC Communications, Inc. ("SBC") and BellSouth Corporation ("BellSouth"). See Section II.A.1.a(iii)(a), Combinations, Sales, and License Swaps, *infra*.

⁵⁹ See Section II.A.1.c, Continued Rise of Digital, *infra*. It should be noted that companies with both types of licenses do not manage their business along spectrum divisions. See, e.g., *AT&T Wireless Group Earnings Commentary*, AT&T Wireless, Jan. 29, 2001, at 6, available at <http://www.att.com/wirelessir/pdf/004q_cmnt.pdf>.

⁶⁰ Operators with cellular and PCS licenses in the same area need phones that can operate on analog cellular networks (800 MHz), cellular networks converted to digital (800 MHz), and digital PCS networks (1900 MHz).

⁶¹ Sprint PCS is a wholly owned tracking group of Sprint Corp. ("Sprint").

⁶² See *Fifth Report*, at 17669. When an operator is described as being "nationwide," it does not necessarily mean that the operator's license areas, service areas, or pricing plans cover the entire land area of the United States. The six mobile telephony carriers that analyst reports typically describe as nationwide all offer service in at least some portion of the western, Midwestern, and eastern United States. See Colette Fleming, Mark Kinarney, and Rohit Sharma, *The Urge to Merge – 2000*, Morgan Stanley Dean Witter, May 22, 2000, at 4-5.

⁶³ See *Fifth Report*, at 17669, but see Section II.A.1.a(iii)(a), Combinations, Sales, and License Swaps, *infra*.

⁶⁴ For a discussion of DOR plans, see *Fifth Report*, at 17675-17676; *Fourth Report*, at 10155-10156.

consumers.⁶⁵

(a) Combinations, Sales, and License Swaps

Since the end of 1999, carriers have continued to build nationwide footprints using combinations, acquisitions, and license swaps.⁶⁶ One of the driving forces behind many of these transactions has been the desire of large regional carriers to enhance their ability to compete with existing nationwide operators that offer attractive nationwide pricing plans. National operators have also sought to fill in gap in their coverage.⁶⁷

Between year end 1999 and the publication of the *Fifth Report* in mid-2000, eight of the top 25 mobile telephone operators (based on year-end 1999 subscribership) had merged to form two larger carriers,⁶⁸ and the proposed joint venture between SBC and BellSouth was pending before the Commission.⁶⁹ Since the writing of the *Fifth Report*, that joint venture has been completed, and a number of other combinations, sales, and license swaps have been announced.⁷⁰ The most significant are discussed below.

Combinations

Cingular - On October 5, 2000, SBC and BellSouth launched their new national wireless joint venture under the name Cingular Wireless.⁷¹ At the time of its closing, the merged company served more than 19 million customers and had licenses covering approximately 190 million potential customers, or "POPs,"⁷²

⁶⁵ See Section II.A.1.d(i), Developments in Pricing Plans, *infra*.

⁶⁶ The Commission must consent to the transfer of control or assignment of all spectrum licenses used to provide wireless telecommunications services. 47 CFR §1.948. The Commission has reviewed thousands of wireless transactions in addition to the ones discussed below. In 2000, the Commission received 2,510 applications involving either the assignment of licenses or the transfer of control of entities holding licenses. In all, these applications involved 32,047 wireless licenses. On average, the Commission received 210 such applications a month, and, on average, the Commission acted on these transactions within 66 days of their appearance on public notice as accepted for filing (or within 50 days of receipt, if the particular application was not required to be placed on public notice).

⁶⁷ For a more complete discussion of the motivations for this phenomenon, see *Fourth Report*, at 10159-10160.

⁶⁸ The wireless assets of Bell Atlantic Corp., GTE Corp. ("GTE"), PrimeCo Personal Communications, and CommNet Cellular, Inc., along with the U.S. wireless assets of Vodafone, became part of Verizon Wireless; and Omnipoint Corp. and Aerial Communications, Inc. became part of VoiceStream. See *Fifth Report*, at 17669-17670.

⁶⁹ The joint venture between SBC and BellSouth was announced in April 2000. *BellSouth, SBC Create 2nd Largest Wireless Company With \$10.2 Billion in Revenues*, News Release, BellSouth, Apr. 5, 2000.

⁷⁰ See Combinations Section, *infra*.

⁷¹ *It's Cingular. New Nationwide Wireless Service Is Born: Joint Venture of SBC and BellSouth Becomes Single Source for Nationwide Wireless Voice, Internet and Data Services*, News Release, Cingular Wireless, Oct. 5, 2000.

⁷² POPs is an industry term referring to population, usually the number of people covered by a given wireless license or footprint. One "POP" equals one person.

in 38 states, the District of Columbia, and two U.S. territories.⁷³ SBC contributed 60 percent of the assets to the new company, while BellSouth contributed 40 percent of the assets, but the companies are sharing control equally.⁷⁴

VoiceStream/Powertel/Deutsche Telekom - On May 31, 2001, Deutsche Telekom AG (“Deutsche Telekom”) completed its acquisition of VoiceStream and Powertel, Inc. (“Powertel”).⁷⁵ This merger combines the two largest GSM wireless providers in the United States.⁷⁶ In the United States, the merged entity holds licenses covering over 272 million POPs, representing 97 percent of the U.S. population.⁷⁷ As of the year-end 2000, VoiceStream and Powertel provided service to a total of 4.8 million U.S. wireless customers.⁷⁸

Verizon Wireless/Price Wireless - On November 15, 2000, Verizon Wireless announced it had signed an agreement to acquire Price Communications Wireless (“Price Wireless”), a wholly owned subsidiary of Price Communications, Inc., for approximately \$2 billion.⁷⁹ This agreement is conditioned on the completion of Verizon Wireless’s planned initial public offering (“IPO”) by September 30, 2001. Price Wireless’s network covers 3.4 million POPs in 16 markets, and the company serves 500,000 customers throughout Georgia, Alabama, South Carolina, and Florida.⁸⁰ Price Wireless’s network uses TDMA, which Verizon Wireless plans to convert to CDMA as quickly as possible after the closing.

Nextel/Chadmoore - In August 2000, Nextel agreed to acquire Chadmoore, a dispatch company with licenses covering 180 small to medium-sized markets.⁸¹ The companies expect to complete the merger by the second half of 2001,⁸² assuming the proposed transfer of control is approved by the Commission and consummated.

⁷³ *It's Cingular. New Nationwide Wireless Service Is Born: Joint Venture of SBC and BellSouth Becomes Single Source for Nationwide Wireless Voice, Internet and Data Services*, News Release, Cingular Wireless, Oct. 5, 2000.

⁷⁴ *Id.*; Application of SBC Communications Inc. and Bellsouth Corporation for Consent to Transfer of Control or Assignment of Licenses and Authorizations, *Memorandum Opinion and Order*, DA 00-2223 (rel. Sept. 29, 2000), at ¶ 7.

⁷⁵ See Section II.A.3.a, Foreign Investment in U.S. Mobile Operators, *infra*, for a discussion of the Deutsche Telekom/VoiceStream merger.

⁷⁶ Powertel held wireless licenses in areas where VoiceStream did not market its wireless services. *Powertel to be Acquired: VoiceStream Coverage to Expand to More Than 245 Million Potential U.S. Wireless Customers*, News Release, VoiceStream, Aug. 27, 2000.

⁷⁷ *VoiceStream Wireless Announces 2000 Financial Results*, News Release, VoiceStream, Feb. 14, 2001.

⁷⁸ See Appendix C, Table 3, at C-4.

⁷⁹ *Verizon Wireless to Purchase Price Communications Wireless for \$2.06 Billion*, News Release, Verizon Wireless, Nov. 15, 2000.

⁸⁰ According to Verizon Wireless, the deal will significantly enhance the footprint and customer base of Verizon Wireless operations in the Southeast. *Id.*

⁸¹ Nextel Communications, Inc., SEC Form 10-Q, Nov. 14, 2000, at 13.

⁸² *Id.*

License Sales and Swaps

Verizon/ALLTEL Sale - On February 20, 2001, Verizon Wireless completed its acquisition of 20 unbuilt 10 megahertz PCS licenses in six states from ALLTEL.⁸³ These new licenses will increase Verizon Wireless's footprint by some 2 million POPs and increase its spectrum holdings in current licensed service areas totaling about 9 million POPs. The new licenses cover markets in Georgia, Missouri, Tennessee, Alabama, and Oklahoma. Financial details of the agreement were not disclosed.

Cingular/VoiceStream Swap - In a major step to expand their market coverage, Cingular and VoiceStream exchanged broadband PCS licenses covering approximately 35 million POPs.⁸⁴ Cingular Wireless acquired 10 megahertz of VoiceStream's spectrum in the New York MTA,⁸⁵ as well as 10 megahertz of its spectrum in both the St. Louis and Detroit BTAs. VoiceStream received 10 megahertz of spectrum in the Los Angeles and San Francisco MTAs, which include the entire states of California and Nevada. The swap was completed in May 2001.⁸⁶

AT&T/Sprint Swap - On November 3, 2000, AT&T Wireless and Sprint PCS announced an agreement to exchange licenses for certain 10 megahertz blocks of PCS spectrum in markets around the country, covering approximately 18.5 million POPs.⁸⁷ Sprint is gaining spectrum in Georgia, North Carolina, New Mexico, Ohio, Tennessee, and Texas, while AT&T Wireless is receiving spectrum in California, Florida, Texas, Utah, and Washington.⁸⁸ The companies are also swapping spectrum within the same BTA (Hartford, Connecticut).⁸⁹

Nextel/Mobex/Arch - Nextel is in the process of acquiring additional SMR spectrum from several carriers.⁹⁰ Mobex, another SMR service provider, is in the process of transferring its 284 800 MHz and

⁸³ *Verizon Wireless Completes Purchase Of 20 PCS Licenses In Six States From ALLTEL*, News Release, Verizon Wireless, Feb. 20, 2001.

⁸⁴ *Cingular, VoiceStream to Swap Wireless Spectrum Covering Over 35 Million People*, News Release, VoiceStream and Cingular Wireless, Nov. 2, 2000.

⁸⁵ The New York MTA covers all five boroughs of New York City, all of Long Island, as well as parts of upstate New York, northeast Pennsylvania, New Jersey, and parts of Connecticut. Through this transaction, Cingular Wireless gains access to an additional 19 million POPs in the New York metropolitan area. *Cingular, VoiceStream to Swap Wireless Spectrum Covering Over 35 Million People*, News Release, VoiceStream and Cingular Wireless, Nov. 2, 2000.

⁸⁶ See Wireless Telecommunications Bureau Assignment of Authorization and Transfer of Control Applications Action, *Public Notice*, Report No. 885 (rel. June 13, 2001), at 11-12.

⁸⁷ *AT&T Wireless To Exchange PCS Spectrum With Sprint*, News Release, AT&T, Nov. 3, 2000.

⁸⁸ See AT&T Wireless PCS, LLC, Application for Consent to Assignment of Licenses, FCC File No. 0000439317 (filed Apr. 26, 2001) (Exhibit 1: *Explanation of Transaction and Public Interest Statement*).

⁸⁹ *Id.*

⁹⁰ In addition, Motorola, Inc. ("Motorola") received consent to transfer 59 900 MHz licenses to Nextel in April 2001. *Motorola Order*.

900 MHz licenses to Nextel.⁹¹ In January 2001, Arch Wireless, Inc. (“Arch”) agreed to sell its SMR licenses to Nextel.⁹² If Nextel completes all its pending acquisitions (including Chadmoore), it will have approximately 20 megahertz of spectrum in 52 of the top 100 U.S. markets.⁹³

While the most high-profile transactions have involved nationwide operators, smaller operators have also made acquisitions to increase the size of their footprints. Leap Wireless International, Inc. (“Leap”), for example, has purchased dozens of spectrum licenses from other licensees since 1999.⁹⁴ And on November 13, 2000, TeleCorp PCS, Inc. (“TeleCorp”) completed its acquisition of fellow AT&T affiliate, Tritel, Inc.⁹⁵

(b) Affiliations

In addition to extending their networks through combinations or license acquisitions, three national operators have extended their coverage through affiliations with smaller carriers.⁹⁶ These affiliations create a “family” of operating companies with much closer relationships than those formed by traditional roaming⁹⁷ agreements. The affiliations were established to accelerate the build-out of the larger companies’ networks by granting smaller affiliates the exclusive right to offer mobile telephony for those companies, in

⁹¹ Wireless Telecommunications Bureau Grants Consent for Assignment of Licenses from Mobex License Company to Nextel Communications, Inc., *Public Notice*, DA 01-493 (rel. Feb 22, 2001) (800 MHz licenses); Wireless Telecommunications Bureau Grants Consent to Assign 900 MHz SMR Licenses, *Public Notice*, DA 01-515 (Feb. 27, 2001) (900 MHz licenses).

⁹² *Nextel to Purchase SMR Spectrum From Arch Wireless*, News Release, Nextel, Jan. 24, 2001. Arch had acquired the licenses from PageNet when it bought that company in November 2000. *Arch Wireless Completes Merger with PageNet*, News Release, Arch, Nov. 20, 2000. See also Arch Wireless and Nextel Communications, Inc. Seek Consent to Assign 900 MHz SMR Licenses, *Public Notice*, DA 01-499 (rel. Feb 26, 2001).

⁹³ In the 800 MHz and 900 MHz bands. *Nextel Reports Record Year 2000 Financial Results*, News Release, Nextel, Feb. 16, 2001.

⁹⁴ Leap Wireless International, Inc., SEC Form 10-K, Mar. 2, 2001, at 31-32

⁹⁵ *TeleCorp and Tritel Complete Merger Creating Top Ten Wireless*, News Release, TeleCorp, Nov. 13, 2000. In a separate transaction, TeleCorp and AT&T Wireless completed an exchange of wireless properties and rights to acquire additional wireless properties in a move to improve the respective service areas of both companies. TeleCorp received licenses covering approximately 4 million people in Wisconsin and Iowa. In return, AT&T Wireless received TeleCorp’s wireless systems in New England, including Worcester and Cape Cod, Massachusetts, and southern New Hampshire, covering a population base of approximately 1.9 million people. As a result of the completion of these transactions, TeleCorp’s licensed service area increased by a net amount of approximately 18 million people. Taken as a whole, TeleCorp’s business now includes PCS licenses covering approximately 35 million people. *Id.*

⁹⁶ In a change from the *Fifth Report*, VoiceStream is no longer discussed in this section because it has acquired from its primary affiliate, Cook Inlet, the overwhelming majority of licenses in which the two companies shared interests. *VoiceStream, Cook Inlet Complete License Swap*, News Release, VoiceStream, Dec. 12, 2000. See also, *Fifth Report*, at 17687-17688.

⁹⁷ See Section II.A.1.d(ii), Roaming, *infra*, for a definition and detailed discussion of roaming.

some cases under the larger companies' brand names, in selected mid-sized and smaller markets.⁹⁸

AT&T - The AT&T family consists of AT&T Wireless's cellular and PCS properties, as well as the ventures it has with four companies: TeleCorp, Triton PCS Holdings, Inc. ("Triton PCS"), Cincinnati Bell Wireless, LLC ("Cincinnati Bell Wireless"),⁹⁹ and Dobson. AT&T Wireless has sold portions of some of its broadband PCS licenses to the ventures with the first three companies in return for a minority ownership interest in the ventures. These three affiliates are currently deploying TDMA technology and AT&T Wireless service under the brand name SunCom in certain areas of the country.¹⁰⁰ In a somewhat different arrangement, AT&T Wireless and Dobson own equal interests in a joint venture, American Cellular Corporation, which provides service primarily in rural areas of the Midwestern and eastern United States.¹⁰¹ AT&T Wireless owns approximately 12 percent of Dobson.¹⁰²

Sprint PCS - The Sprint PCS family consists of Sprint PCS and 14 affiliates.¹⁰³ Each of the affiliates has an agreement with Sprint PCS to use the latter's PCS licenses to deploy CDMA technology and Sprint PCS-branded service in specific areas of the country.¹⁰⁴ Some of the affiliates also hold their own broadband PCS licenses, and at least two affiliates – US Unwired, Inc. ("US Unwired") and Via Wireless,

⁹⁸ "For example, to facilitate rapid deployment of its network throughout suburban, tertiary and rural areas of the country and move towards more ubiquitous nationwide service, Nextel entered into an agreement with Nextel Partners . . . to construct iDEN coverage using Commission licensed frequencies disaggregated by Nextel to [Nextel Partners], and offering its services to the public under the Nextel brand according to strict service quality standards." Nextel, Automatic and Manual Roaming Obligations Pertaining to Commercial Mobile Radio Services, *Comments*, WT Docket No. 00-193, at note 20.

⁹⁹ Cincinnati Bell Wireless is a joint venture of Broadwing, Inc. ("Broadwing") and AT&T Wireless, in which AT&T Wireless owns 19.9 percent and Broadwing owns the remaining 80.1 percent. Broadwing, Inc., SEC Form 10-K, Mar. 16, 2001, at 4.

¹⁰⁰ Cincinnati Bell Wireless services are sold under the Cincinnati Bell Wireless brand name.

¹⁰¹ Dobson Communications Corp., SEC Form 8-K, Mar. 9, 2000, at 2. On May 30, 2000, AT&T and Dobson entered into an agreement to expand the operations of the joint venture into northeastern Oklahoma and several adjacent counties in Kansas. Under this agreement, AT&T contributed PCS licenses to the joint venture. Dobson Communications Corp., SEC Form 10-Q, Nov. 14, 2000, at 18.

¹⁰² DCC PCS, Inc., Auction No. 35, FCC Form 601, Exhibit A (submitted Feb 21, 2001). AT&T has stated that it is evaluating its relationship with Dobson. *AT&T Will Continue to Evaluate Dobson Stake*, Yahoo! News, Feb. 20, 2001 <<http://biz.yahoo.com/rf/010220/n20434866.html>>.

¹⁰³ Margo McCall, *Market Madness Hinders Wireless Consolidation*, WIRELESS WEEK, Apr. 9, 2001, at 15. Two Sprint PCS affiliates - Bright Personal Communications Services, Inc. and Horizon Personal Communications, Inc. - merged in June 2000. *Bright PCS and Horizon PCS Sign Agreement to Form Largest Sprint PCS Network Partner*, News Release, Telephone Service Company, June 16, 2000. Three other Sprint PCS affiliates, Washington Oregon Wireless, Roberts Wireless Communications, and Southwest PCS Holdings, Inc. merged into a fourth affiliate, Alamosa Holdings, Inc. ("Alamosa"). *Alamosa PCS Becomes Largest Sprint PCS Network Partner With Completion of The Roberts Wireless and Washington Oregon Wireless Mergers*, News Release, Alamosa, Feb. 14, 2001; *Alamosa Closes Third Network Partner Transaction*, News Release, Alamosa, Apr. 2, 2001. See also note 105.

¹⁰⁴ See, e.g., US Unwired Inc., SEC Form 4249(B)(1), May 17, 2000, at 7.

LLC (“Via”)¹⁰⁵ – are using a combination of their own spectrum licenses and Sprint’s to deploy service.

Nextel - The Nextel family consists of Nextel and Nextel Partners, Inc. (“Nextel Partners”). In an arrangement similar to that of AT&T with its affiliates, Nextel has sold some of its SMR licenses to Nextel Partners in return for a minority ownership interest in the company.¹⁰⁶ Nextel Partners is building out an iDEN network, and Nextel is providing many of the support services.¹⁰⁷

(iv) Auction No. 35

On January 26, 2001, the Commission’s most recent auction of C and F block broadband PCS licenses, Auction No. 35, closed. The Commission offered a total of 422 C and F block broadband PCS licenses covering 195 markets, and all of the licenses were sold.¹⁰⁸ Many licenses in the auction were available because parties that had won licenses for the same spectrum had defaulted on their installment or other payments to the Commission, while others were available because licenses had been unsold in previous auctions.¹⁰⁹ Net high bids totaled \$16.9 billion.¹¹⁰ The Auction No. 35 licenses produced significantly more revenue than many analysts expected,¹¹¹ and much more revenue than the \$5.2 billion raised in earlier

¹⁰⁵ Via is being bought by another Sprint PCS affiliate, UbiquiTel, Inc. (“UbiquiTel”). *UbiquiTel to Acquire VIA Wireless*, News Release, UbiquiTel, Feb. 23, 2001. In March 2000, UbiquiTel signed an agreement with VoiceStream to sell Via’s California properties to VoiceStream after UbiquiTel completes the acquisition of Via. *UbiquiTel to Sell Spectrum*, News Release, UbiquiTel, Mar. 6, 2001.

¹⁰⁶ See note 98 and Nextel Partners, Inc., SEC Form S-4/A, Nov. 9, 2000, at 1. As of Sept. 30, 2000, Nextel owned 32.4 percent of Nextel Partners. Nextel Partners, SEC Form S-4/A, Nov. 9, 2000, at 1.

¹⁰⁷ Nextel Partners, Inc., SEC Form 10-Q, Nov. 15, 1999, at 9.

¹⁰⁸ Federal Communications Commission, Auction #35: C & F Block Auction – Charts, *Results for All Markets* (visited Apr. 2, 2001) <http://www.fcc.gov/wtb/auctions/c_f_blk/35market.xls>.

¹⁰⁹ C And F Block Broadband PCS Spectrum Auction Scheduled For November 29, 2000, Rescheduled For December 12, 2000, *Public Notice*, Sept. 6, 2000. Potential bidders for Auction No. 35 and other interested parties were notified of the possible pendency of various proceedings that might have related to the licenses available in Auction No. 35, including proceedings initiated by parties claiming to have continuing interests in Auction No. 35 licenses, despite the failure of those parties to meet payment obligations. *Id.*; C and F Block Broadband PCS Spectrum Auction Scheduled for December 12, 2000, *Public Notice*, Oct. 12, 2000. See also Public Notice DA 00-49 Auction of C and F Block Broadband PCS Licenses NextWave Personal Communications, Inc. and NextWave Power Partners Inc. Petition for Reconsideration; In re Settlement Request Pursuant to DA 99-745 For Various Broadband PCS C block Licenses, *Order on Reconsideration*, 15 FCC Rcd 17,500 (2000), *appeal docketed sub nom.*, NextWave Personal Communications, Inc. v. FCC, Nos. 00-1402, 00-1403 (D.C. Cir. Sept. 15, 2000). Potential bidders were cautioned that they were solely responsible for identifying risks associated with such pending proceedings and for investigating and evaluating the degree to which such matters might affect their ability to bid on or otherwise acquire licenses in Auction No. 35. C and F Block Broadband PCS Spectrum Auction Scheduled For November 29, 2000, Rescheduled For December 12, 2000, *Public Notice*, Sept. 6, 2000; C and F Block Broadband PCS Spectrum Auction Scheduled for December 12, 2000, *Public Notice*, Oct. 12, 2000.

¹¹⁰ Federal Communications Commission, *C and F Block Broadband PCS License Auction Fact Sheet Auction No. 35* (visited Apr. 2, 2001) <http://www.fcc.gov/wtb/auctions/c_f_blk1.html>.

¹¹¹ While a number of analysts had predicted prices of \$10 billion or more for these licenses, few had predicted numbers quite so high. Lehman Brothers had estimated \$11 billion, and Raymond James & Associates had predicted \$8 to \$10 billion. John M. Bensché and Courtney B. Kelleher, *Wireless Services Industry Update: C*

auctions of licenses for the same spectrum.¹¹²

Auction No. 35 differed in significant ways from the earlier C and F block auctions. Participation in earlier auctions had been limited solely to “entrepreneurs” (applicants, including attributable investors and affiliates, with gross revenue of less than \$125 million in each of the preceding two years and less than \$500 million in total assets).¹¹³ Shortly before Auction No. 35, that restriction was partially lifted,¹¹⁴ allowing non-entrepreneurs to bid on 252 of the available 422 licenses.¹¹⁵

Winning bids were highest for densely populated, urban BTAs. The New York BTA alone, for example, raised \$5.6 billion, 33 percent of the total auction receipts, for three 10 megahertz licenses.¹¹⁶ The top ten markets (by population) accounted for \$10.1 billion, or 60 percent of the total.¹¹⁷ Ten bidders’ total net high bids accounted for the lion’s share of the auction receipts (98.7 percent).¹¹⁸

The large sum of money committed in Auction 35 surprised many in the investment community. As one analyst commented in reference to Verizon Wireless’s \$8.8 billion in bids, “What Do They Know We Don’t Know?”¹¹⁹ More understated, another analyst commented that the auction prices paid were “quite

and F Block Re-auction Concludes, Nets \$16.9B, Equity Research, Lehman Brothers, Jan.29, 2001, at 8; Ric Prentiss, *et al.*, *Super Auction XXXV Is Over*, Equity Research, Raymond James & Associates, Jan. 30, 2001, at 1. Investment bank ING Barings did suggest a “high-end” of \$18.7 billion, citing the prices paid in the UK and German 3G auctions from 2000 as indicative of spectrum value. Frank Marsala and Dave B. Rao, *Bidders Approved in 1.9 GHz Auction*, Wireless Telecommunications, ING Barings, Dec. 5, 2000, at 3. However, ING Barings said it “did not expect to see the high-end.” *Id.* at 4.

¹¹² Federal Communications Commission, *General Auction Data: PCS Blocks A-F Aggregation* (visited Apr. 2, 2001) <<http://www.fcc.gov/wtb/auctions/summary/abcdef2.xls>>. The file was last revised June 14, 1999, and includes results from Auction No. 22.

¹¹³ Amendment of the Commission’s Rules Regarding Installment Payment Financing for Personal Communications Services (PCS) Licensees, *Sixth Report And Order And Order On Reconsideration*, 15 FCC Rcd 16266, 16282 (2000) (“*Auction 35 Order*”).

¹¹⁴ *Id.*, at 16275-82.

¹¹⁵ Federal Communications Commission, Auction #35: C & F Block Auction – Charts, *Results for All Markets* (visited Apr. 2, 2001) <http://www.fcc.gov/wtb/auctions/c_f_blk/35market.xls>.

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ The top 10 bidders were Cellco Partnership, d/b/a Verizon Wireless (“Verizon Wireless”); Alaska Native Wireless, L.L.C. (“Alaska Native”); Salmon PCS, LLC (“Salmon”); DCC PCS, Inc. (“DCC PCS”); Cook Inlet/VS GSM V PCS, LLC (“Cook Inlet/VS GSM”); VoiceStream PCS BTA I License Corporation (“VoiceStream”); Leap Wireless International, Inc.; Black Crow Wireless, L.P. (“Black Crow”); SVC BidCo, L.P. (“SVC BidCo”); and Lafayette Communications Company L.L.C. (“Lafayette”). See Appendix B, Table 4, at B-6.

¹¹⁹ John M. Bensch and Courtney B. Kelleher, *Wireless Services Industry Update: C and F Block Re-auction Concludes, Nets \$16.9B*, Equity Research, Lehman Brothers, Jan.29, 2001, at 2. Peter Friedland of W.R. Hambrecht & Co. said, “If someone told me before the auction that Verizon was going to bid half of the total bids in the auction, I would have found that hard to believe.” Dan Meyer, *Re-auction Brings in Record \$17B*, RCR WIRELESS NEWS, at 61-62.

high.”¹²⁰ While obviously only the bidders knew their auction strategies, analysts perceived some common goals, including adding capacity, filling-in footprint holes, and expanding regional clusters.¹²¹ One analyst believed that the auction prices reflected how larger operators value a true national footprint as well as the additional services that can be used with the new spectrum.¹²²

b. Market Performance

Some of the key metrics reported by mobile telephone operators, such as subscriber growth, average monthly usage per subscriber, and average revenue per subscriber, demonstrate the increased demand for and reliance placed on mobile services. In addition, continued downward price trends,¹²³ churn, and continued expansion of mobile networks into new and existing markets demonstrate a high level of competition for mobile telephony customers.

(i) Subscriber Growth

In 2000, the mobile telephone sector experienced another record year. As of December 2000, the industry estimates that the sector had over 109.5 million subscribers,¹²⁴ which translates into a nationwide penetration rate of roughly 39 percent.¹²⁵ This figure also represents a 28 percent increase over the 86.0 million subscribers reported for December 1999. Also, the absolute increase of 23.5 million subscribers represents the largest 12-month jump in subscribership in the history of the sector, surpassing 1999’s previous record of 16.9 million additional subscribers. In addition to the overall penetration rate of 39 percent, a recent study found that 46 percent of households with incomes of at least \$25,000 have wireless

¹²⁰ Ric Prentiss, *et al.*, *Super Auction XXXV is Over*, Equity Research, Raymond James & Associates, Jan. 30, 2001, at 1.

¹²¹ See, e.g., Ric Prentiss, *et al.*, *Super Auction XXXV is Over*, Equity Research, Raymond James & Associates, Jan. 30, 2001, at 2; and John M. Bensch and Courtney B. Kelleher, *U.S. Spectrum Auction Guide*, Equity Research, Lehman Brothers, Feb. 14, 2001, at 1.

¹²² Dan Meyer, *Re-auction Brings in Record \$17B*, RCR WIRELESS NEWS, at 62 (citing Larry Swasey of Allied Business Intelligence, Inc.).

¹²³ See II.A.1.d, Pricing Data and Trends, *infra*.

¹²⁴ See Appendix C, Table 2, at C-2. Since the Commission’s local competition and broadband data gathering program was adopted in March 2000, mobile wireless carriers with over 10,000 facility based subscribers in a state are now required to report the number of their subscribers in those states twice a year to the Commission (as the information is filed on FCC Form 477, we will refer hereinafter to the results gathered through the program as *FCC Form 477*). In their most recent filings, operators reported that, as of December 31, 2000, they served 101.2 million subscribers. See Appendix C, Table 2, at C-3. That estimate differs by approximately 8 percent from Cellular Telecommunications and Internet Association’s (“CTIA”) December 31, 2000 estimate of 109.5 million. To maintain consistency with previous reports, this report uses CTIA’s estimate. The Commission does not at this time determine which is the better estimate. However, the Commission does recognize that its reporting rules result in some level of undercount of total industry subscribers since it does not count at all subscribers served by mobile telephony providers in states where the provider has less than 10,000 customers. See Local Competition and Broadband Reporting, *Report and Order*, 15 FCC 7717, 7743 (2000).

¹²⁵ DCC PCS, Inc., Auction No. 35, FCC Form 601, Exhibit A (submitted Feb 21, 2001).

service, up from 35 percent in 1998.¹²⁶

(ii) Minutes-of-Use

While estimates of average minutes-of-use per subscriber per month (“MOUs”) vary, all show an increase between 1999 and 2000. Increasing MOUs most likely are a result of the decreasing prices and the wider acceptance of and reliance upon wireless service.¹²⁷ Some analysts speculate that higher usage also reflects how carriers are using minutes as a promotional device to entice and retain customers. Giving customers more minutes not only makes them feel that they are getting more for their money,¹²⁸ but makes them increasingly dependent on their cell phones and on particular companies.¹²⁹

According to the CTIA mobile telephone survey, MOUs were 255 between July and December 2000, an increase of 38 percent from 185 MOUs during the same period in 1999.¹³⁰ Other analysts, using different methodologies, also report higher MOUs in 2000. Paul Kagan and Associates estimated MOUs of 335 in mid-2000, up from 261 in mid-1999.¹³¹ J.D. Powers & Associates estimated 320 MOUs, an increase of 32 percent from 242 a year earlier, and a 61 percent increase from 1998.¹³² Taken together, these average 303 MOUs in 2000, a 32 percent increase from an average of 229 MOUs in 1999. Using a somewhat different metric, International Data Corporation (“IDC”) found that U.S. household wireless usage (which can include multiple wireless units within a particular household) was 247 MOUs in 2000, compared with 155

¹²⁶ *Wireless Usage Continues to Climb as Flat-Rate Pricing and Free Minutes Become More Prevalent in the Marketplace*, News Release, J.D. Power and Associates, Sept. 26, 2000. An additional 8 percent of households indicate that they plan to subscribe to wireless services within the next year. *Id.*

¹²⁷ Michael Rollins, *et al.*, *Wireless by the Minute*, Equity Research, Salomon Smith Barney, Jan. 8, 2001, at 5.

¹²⁸ According to Scott Relf, senior vice president of Sprint PCS, “Generally speaking, most plans have more than enough minutes and consumers can’t use them all. But the consumer feels they’re getting more of a tangible value when they get more of them.” Caroline E. Mayer, *Griping About Cellular Bills: Differences From ‘Regular’ Phones Take New Users by Surprise*, WASHINGTON POST, Feb. 28, 2001, at G17.

¹²⁹ “[Companies] want to get people to be using their wireless more than their home phone and if you give people more minutes, they will give out their cell phone numbers much more,” according to Alan Brune, vice president of marketing of Telephia, a San Francisco marketing firm specializing in wireless data. “And if they give out their phone numbers, they’ll be reluctant to switch to another firm because right now they can’t transfer their phone number with them.” Caroline E. Mayer, *Griping About Cellular Bills: Differences From ‘Regular’ Phones Take New Users by Surprise*, WASHINGTON POST, Feb. 28, 2001, at G17.

¹³⁰ Peggy Albright, *CTIA Survey Reflects Industry Strength*, WIRELESS WEEK, Apr. 30, 2001, at 3 (citing CTIA). CTIA aggregated all of the carriers’ MOUs from July 1 through December 31, 2000, then divided by the average number of subscribers, and then divided by six. Telephone conversation with Pramesh Jobanputra, CTIA, Apr. 30, 2001.

¹³¹ Paul Kagan Associates, Inc., *Minutes Up By 28% in Quarter; Acquisition Costs Continue Decline*, WIRELESS MARKET STATS, Aug. 14, 2000, at 6.

¹³² *Newer Wireless Telephony Entrants Make Dramatic Impact in the Wireless Marketplace*, News Release, J.D. Power and Associates, Sept. 23, 1999; *Wireless Usage Continues to Climb as Flat-Rate Pricing And Free Minutes Become More Prevalent in the Marketplace*, News Release, J.D. Power and Associates, Sept. 26, 2000.

MOUs in 1999 and 89 MOUs in 1998.¹³³

(iii) Average Revenue Per Unit

Increased MOUs may counteract any negative effect of falling prices on the average monthly revenue per subscriber (often referred to as average revenue per unit, or “ARPU”). For the mobile telephone sector, ARPU has decreased almost continuously since CTIA began tracking it in 1987, going from a peak of \$98.02 in December 1988 to a low of \$39.43 in December 1998.¹³⁴ However, since 1999, ARPU has begun increasing, first to \$41.24 in December 1999, then to \$45.27 in December 2000, a 15 percent increase over the last two years. As previously discussed in the *Fifth Report*, analysts attribute this rise to customers using their phones more often.¹³⁵

(iv) Churn

Churn refers to the number of customers an operator loses over a given period of time. Mobile telephone operators usually express churn in terms of average percent churn per month. For example, an operator might report average monthly churn of 2 percent in a given fiscal quarter. In other words, on average, the operator lost 2 percent of its customers in each of the quarter’s three months. At this rate, the operator would lose 24 percent of its customers in a single year.¹³⁶ Given that churn provides an approximate measure of the frequency with which subscribers switch operators,¹³⁷ it is often used as an indicator of increasing competition.¹³⁸ Most carriers report churn rates between 1.5 percent and 3 percent per month.

According to one recent survey, almost one in five wireless subscribers have switched carriers in the past year.¹³⁹ Sixteen percent of those who switched said that their primary reason for doing so was dissatisfaction with their current pricing plan.¹⁴⁰ Twelve percent dropped their current service in search of

¹³³ *Mobile Phone Users Use Significantly More Minutes in 2000*, News Release, IDC, May 9, 2000.

¹³⁴ See Appendix C, Table 1, at C-2.

¹³⁵ Michael Rollins, *et al.*, *Wireless by the Minute*, Equity Research, Salomon Smith Barney, Jan. 8, 2001, at 4; Caroline E. Mayer, *Gripping About Cellular Bills: Differences From 'Regular' Phones Take New Users by Surprise*, WASHINGTON POST, Feb. 28, 2001, at G17 (citing Travis Larson of CTIA); *Fifth Report*, at 17682.

¹³⁶ This assumes that each churned customer is a unique individual and that the same customers do not churn multiple times.

¹³⁷ Some subscribers do not sign on with another carriers once they leave their current one. See note 139, *infra*.

¹³⁸ See, e.g., Michael Rollins, *et al.*, *Wireless by the Minute*, Equity Research, Salomon Smith Barney, Jan. 8, 2001, at 27 (Figure 27: Subscribers).

¹³⁹ *Wireless Phone User Habits Indicate That Switching Providers Is A Significant Industry Concern*, News Release, Telephia, Jan. 16, 2001. In addition to the 20 percent of subscribers who switched carriers in the past year, approximately 8 to 10 percent of wireless subscribers temporarily suspended, or in some cases disconnected, their service. *Id.*

¹⁴⁰ *Id.*

better network quality, and 10 percent left in order to take advantage of a competitor's promotion.¹⁴¹ The survey also found that almost half (44 percent) of all wireless users have no strong commitment to stay with their current carrier.¹⁴² In addition, according to another survey released in May 2000, only 60 percent of subscribers had a "contract,"¹⁴³ down from 70 percent a year earlier.¹⁴⁴

(v) Market Entry

To track the level of competition in the mobile telephony market, the Commission has compiled a list of counties with some level of coverage by mobile telephone providers.¹⁴⁵ This analysis is based on publicly available sources of information released by the operators such as news releases, filings with the Securities and Exchange Commission ("SEC"), and coverage maps available on operators' Internet sites.¹⁴⁶

There are several important caveats to note when considering these data. First, to be considered as "covering" a county, an operator need only be offering service in a portion of that county. Second, multiple operators shown as covering the same county are not necessarily providing service to the same portion of that county. Consequently, some of the counties included in this analysis may have only a small amount of coverage from a particular provider. Third, the POPs and square miles figures in this analysis include all of the POPs and all of the square miles in a county considered to have coverage.¹⁴⁷ Therefore, this analysis overstates the total coverage in terms of both geographic areas and populations covered.

To date, 259 million people, or almost 91 percent of the total U.S. population, have three or more different operators (cellular, PCS, and/or digital SMR) offering mobile telephone service in the counties in which

¹⁴¹ *Id.* Other common reasons for switching included calling coverage, customer service, additional product features, and an employer switching providers. *Id.*

¹⁴² *Id.*

¹⁴³ For purposes of this report, a contract is for a specified period of time, as opposed to a month-to-month agreement.

¹⁴⁴ *Mobile Phone Users Use Significantly More Minutes in 2000*, News Release, IDC, May 9, 2000.

¹⁴⁵ In past editions of this report, the Commission provided summaries of estimated coverage by BTAs. Starting with the *Fifth Report*, the Commission decided to re-estimate and enhance these coverage maps using county boundaries in an attempt to provide a more precise picture of network deployments.

¹⁴⁶ The Commission has buildout rules for geographic area licenses, although they do not require operators to deploy networks such that the entire geographic area of a specific license receives coverage. For example, the construction requirements for 30 megahertz broadband PCS licenses state that an operator's network must serve an area containing at least one-third of the license area's population within five years of the license being granted and two-thirds of the population within 10 years. *See* 47 C.F.R. § 24.203(a). Similarly, the construction requirements for 10 and 15 megahertz broadband PCS licenses state that an operator must cover one-quarter of a license area's population, or provide "substantial service," within five years of being licensed. *See* 47 C.F.R. § 24.203(b). The details concerning exactly which geographic areas or portions of the population should be covered to meet these requirements are left to the operators. In addition, decisions about whether to increase coverage above these requirements are left to the operators. For information on the buildout requirements for cellular licenses, *see* 47 C.F.R. §§ 22.946, 22.947, 22.949, 22.951.

¹⁴⁷ All population figures are based on the Bureau of the Census's 2000 county population.

they live.¹⁴⁸ However, these counties make up only 40 percent of the total land area of the United States, reflecting the nation's uneven population distribution.¹⁴⁹ On the other hand, the land area of these counties, 1.4 million square miles, is roughly equal to the combined land area of the 15 members of the European Union.¹⁵⁰ In addition, over 214 million people, or 75 percent of the U.S. population, live in areas with five or more mobile telephone operators competing to offer service.¹⁵¹

While growth in the percentage of the population covered by three or more providers has been small in the past year,¹⁵² the percentage growth of the population covered by six or more providers has been significant. Over 133 million people, or 47 percent of the U.S. population, live in areas with six or more mobile telephone operators competing to offer service, an increase of 35 percent from 1999.¹⁵³ And 34 million people, or about 12 percent of the population, can now choose from among seven or more different mobile telephone operators, an increase of 170 percent from 1999.¹⁵⁴

c. Continued Rise of Digital

The rise of digital technology in the mobile telephone sector documented in the last two reports continues.¹⁵⁵ During 2000, the number of customers subscribing to digital services jumped 55 percent from approximately 44.3 million to 67.7 million.¹⁵⁶ Digital subscribers now make up 62 percent of all wireless subscribers, up from 51 percent last year, and 30 percent at the end of 1998. The four primary competing digital technologies experienced growth in subscribership ranging from 44 to 72 percent. In addition, almost all new mobile phones sales are digital.¹⁵⁷

Even as new subscribers are overwhelmingly signing up for digital service,¹⁵⁸ operators continue to move

¹⁴⁸ See Appendix C, Table 4, at C-5.

¹⁴⁹ *Id.*

¹⁵⁰ See *Fifth Report*, at 17677.

¹⁵¹ *Id.*

¹⁵² Only 3 percent, due to its previous high level of 87.8 percent. See *Fifth Report*, at 17747.

¹⁵³ See Appendix C, Table 4, at C-5.

¹⁵⁴ *Id.*

¹⁵⁵ See *Fourth Report*, at 10154, and *Fifth Report*, at 17672-17673.

¹⁵⁶ See Appendix C, Table 6, at C-6. The number of analog subscribers remained approximately the same as 1999, slightly less than 42 million.

¹⁵⁷ See, e.g., Leif Soderberg, Sr. VP & GM Strategy Business Development and Industry Relations PCS, Motorola, Inc., *Presentation*, UBS Warburg Fifth Global Telecom Conference, Nov. 11, 2000 (handset forecast for 2000). In 2000, Motorola announced that it would discontinue making analog handsets. Motorola, First Quarter Earnings Release Conference Call, Apr. 11, 2001, available at < http://www.corporate-ir.net/ireye/ir_site.zhtml?ticker=MOT&script=1200>.

¹⁵⁸ For example, in the Washington/Baltimore region, 90 percent of Verizon Wireless's new customers are digital. Rob Pegoraro, *The Decline (But Not Fall) Of Analog Cellular*, THE WASHINGTON POST, Sept. 29, 2000, at E15 (citing a Verizon spokeswoman).

their existing subscriber base from analog to digital services.¹⁵⁹ At the end of 2000, for example, 90.1 percent of AT&T Wireless's nearly 15.2 million consolidated subscribers used digital service, up from 79.2 percent a year earlier.¹⁶⁰ More than half of Verizon Wireless's customers now subscribe to its digital services, and those customers generate more than 80 percent of the company's "busy-hour" usage.¹⁶¹ Cingular Wireless states that 85 percent of its customers subscribe to digital service.¹⁶²

Operators also continued to expand the footprints of their chosen digital technology in 2000. This drive stems from operators with analog networks, who need to improve capacity, increase their advanced service offerings, and provide compatibility for digital-based roaming partners, as well as from new, all-digital network operators who need to expand their footprints to increase their competitiveness.¹⁶³

Four major mobile telephone operators - AT&T Wireless, Verizon Wireless, Cingular Wireless, and ALLTEL - are both cellular and broadband PCS licensees, and these carriers have deployed digital technology extensively throughout their networks. Ninety-nine percent of AT&T Wireless's network has been upgraded to digital.¹⁶⁴ Verizon Wireless's digital network reaches approximately 75 percent of its covered POPs,¹⁶⁵ Cingular Wireless's, 95 percent;¹⁶⁶ and ALLTEL's, over 85 percent.¹⁶⁷ Even operators with only cellular licenses are well along in the conversion of their analog networks to digital. US Cellular, for example, offers digital service in 85 percent of its coverage areas using a mix of TDMA and CDMA. CTIA estimates that carriers have designated four times as many channels for digital use as for analog use.¹⁶⁸

¹⁵⁹ According to Verizon Wireless, "We are aggressively encouraging our customers to make the switch from analog to digital." Dan Meyer, *Analog Service Not Fading Away*, RCR WIRELESS NEWS, Jan 18, 2001, at 18. Both AT&T and Cingular plan to move their analog subscribers onto digital plans over the next few years. *Id.* ALLTEL believes migrating customers to digital will help it to reduce churn. ALLTEL Corp., SEC Form 10-Q, Nov. 13, 2000, at 19.

¹⁶⁰ *AT&T Wireless Group Earnings Commentary*, AT&T, Jan. 29, 2001, at 1, available at <http://www.att.com/wirelessir/pdf/004q_cmnt.pdf>.

¹⁶¹ *Verizon Communications Posts Strong Results For Fourth Quarter and 2000*, News Release, Verizon, Feb. 1, 2001. The "busy-hour" is the hour of the day during which a telephone system carries the most traffic.

¹⁶² Dan Meyer, *Analog Service Not Fading Away*, RCR WIRELESS NEWS, Jan 18, 2001, at 18.

¹⁶³ *See Fourth Report*, at 10170.

¹⁶⁴ *AT&T Wireless Group Earnings Commentary*, AT&T, Jan. 29, 2001, at 1, available at <http://www.att.com/wirelessir/pdf/004q_cmnt.pdf>.

¹⁶⁵ Verizon Wireless, Inc., SEC Form S-1, Aug. 24, 2000, at 1.

¹⁶⁶ BellSouth Corporation, SEC Form 10-K, Mar. 2, 2001, at 13.

¹⁶⁷ Dan Reingold, *et al.*, *CSFB Global Telecom CEO Conference Summary*, U.S./Wireline Telecommunications Services, Credit Suisse First Boston, Mar. 19, 2001, at 29.

¹⁶⁸ Heather Forsgren Weaver, *FCC to Assess Whether to Eliminate Analog Set Aside*, RCR WIRELESS NEWS, Jan 29, 2001, at 19.

(i) Coverage by Technology Type

Of the six nationwide mobile telephone operators, Sprint PCS and Verizon Wireless have CDMA as their digital technology, AT&T Wireless uses TDMA,¹⁶⁹ VoiceStream uses GSM, and Nextel uses iDEN. Cingular Wireless has a mix of TDMA and GSM networks.

To date, 271 million people, or 95 percent of the total U.S. population, live in counties where operators offer digital mobile telephone service, using CDMA, TDMA, GSM, and/or iDEN technologies.¹⁷⁰ These counties make up 57 percent of the total land area of the United States. To estimate the current levels of deployment of the four main digital mobile telephone technologies individually, the Commission has prepared maps of each technology combining the coverage by all of the relevant operators.¹⁷¹

CDMA and TDMA technologies are available to roughly equal numbers of Americans. CDMA has been launched in at least some portion of counties containing 242 million people, or 85 percent of the U.S. population,¹⁷² while TDMA has been launched in at least some portion of counties containing 238 million people, or 83 percent of the U.S. population.¹⁷³ GSM has been launched in at least some portion of counties containing 197 million people, or approximately 69 percent of the U.S. population.¹⁷⁴

Digital SMR operators are the only users of iDEN technology in the United States. To date, digital SMR operators have launched iDEN-based service in at least some portion of counties containing over 232 million people, or approximately 81 percent of the U.S. population.¹⁷⁵

d. Pricing Data and Trends

It is difficult to identify sources of information that track mobile telephone prices in a comprehensive manner.¹⁷⁶ However, a number of reports and other available data indicate that the entrance of new competitors into the mobile telephone market continues to reduce prices. Because these studies use different methodologies and market samples, their findings vary and are comparable only in the broadest terms. Nevertheless, they clearly show that the average price of mobile telephony service has fallen since the *Fifth Report*, continuing the trend of the last several years.

¹⁶⁹ AT&T has announced plans to overlay GSM on its TDMA network in order to improve its wireless data capabilities and migrate to 3G technology. See Section II.B.1.c, 3G Developments, *infra*.

¹⁷⁰ The broadband PCS-based coverage is estimated using counties and the cellular-based coverage is estimated using CMAs. The same caveats mentioned in Section II.A.1.b(v), Market Entry, *supra*, apply to this analysis as well.

¹⁷¹ See Appendix E, Maps 2-6, at E-3 - E-7.

¹⁷² See Appendix C, Table 7, at C-10 and Appendix E, Map 3, at E-4.

¹⁷³ *Id.* at C-10 and E-5.

¹⁷⁴ *Id.* at C-10 and E-6.

¹⁷⁵ *Id.* at C-10 and E-7.

¹⁷⁶ See *Fourth Report*, at 10164-10165.

According to one economic research and consulting firm, prices declined roughly 7 percent in 2000.¹⁷⁷ The average cost of monthly service - which was calculated across four typical usage plans (30, 150, 300 and 600 minutes) across 25 major cities - dropped from \$42.53 in December 1999 to \$39.60 in December 2000. Data are not currently available for smaller markets. The biggest price declines came for customers who subscribed to plans offering 600 minutes of talk time each month, whose prices dropped by 10.1 percent, while those on monthly plans with fewer minutes saw more modest reductions. In evaluating pricing plans offered in major markets across the nation, another analyst estimates that the average price per minute for wireless service fell by 25 percent between 1999 and 2000.¹⁷⁸

Another source of price information is the cellular telephone services component of the Consumer Price Index ("Cellular CPI") produced by the United States Department of Labor's Bureau of Labor Statistics.¹⁷⁹ During 2000, the Cellular CPI¹⁸⁰ decreased by 12.3 percent while the overall CPI increased by 3.4 percent. In comparison, the local telephone services component increased by 5.5 percent while the long distance telephone services component decreased by 9.2 percent. The Cellular CPI has declined almost 30 percent since the end of 1997.

(i) Developments in Pricing Plans

The continued rollout of differentiated pricing plans indicates a competitive marketplace. In the mobile telephone sector, a single operator often tries a new and innovative pricing plan, and is later imitated by competitors if the plan proves to be successful. For example, many in the industry questioned AT&T Wireless's wisdom when it introduced the first DOR plan in May 1998.¹⁸¹ Today virtually all of the major operators offer a similar type of DOR pricing plan that allows customers to purchase a bucket of MOUs on

¹⁷⁷ Econ One, *Cell Service Costs Drop Nearly 7% in 2000*, News Release, Jan 18, 2001.

¹⁷⁸ The Strategis Group, Inc., 2001.

¹⁷⁹ Appendix C, Table 8, at C-7. The Consumer Price Index ("CPI") is a measure of the average change over time in the prices paid by urban consumers for a fixed market basket of consumer goods and services. The basket of goods includes over 200 categories including items such as food and beverages, housing, apparel, transportation, medical care, recreation, education, and communications. The CPI provides a way for consumers to compare what the market basket of goods and services costs this month with what the same market basket cost a month or a year ago. Starting in December of 1998, this basket of goods included a category for cellular telephone services. All CPI figures discussed in this paragraph were taken from U.S. Department of Labor, Bureau of Labor Statistics databases found on the Bureau of Labor Statistics' Internet site at <<http://www.bls.gov/sahome.html>>. The index used in this analysis, the CPI for All Urban Consumers (CPI-U), represents about 87 percent of the total U.S. population. Bureau of Labor Statistics, *Consumer Price Index: Frequently Asked Questions* (visited June 18, 2001) <<http://www.bls.gov/cpifaq.htm>>.

¹⁸⁰ The Cellular CPI includes charges from all telephone companies that supply "cellular telephone services," which are defined as "domestic personal consumer phone services where the telephone instrument is portable and it sends/receives signals for calls by wireless transmission." This measure does not include business calls, telephone equipment rental, portable radios and pagers. Bureau of Labor Statistics, *How BLS Measures Price Change for Cellular Telephone Service in the Consumer Price Index* (visited May 14, 2001) <<http://www.bls.gov/cpifactc.htm>>.

¹⁸¹ See *AT&T Launches First National One-Rate Wireless Service Plan*, News Release, AT&T Corporation ("AT&T"), May 7, 1998.

a nationwide or nearly nationwide network without incurring roaming or long distance charges.¹⁸²

In addition to the national pricing plan trend, a number of large carriers - including AT&T Wireless, Verizon Wireless, and Cingular Wireless - have begun offering regional DOR calling plans.¹⁸³ These plans give customers a bucket of MOUs to use in a particular region without incurring roaming or long distance charges. Verizon Wireless's SingleRate West calling plan, for example, allows customers to call from anywhere to anywhere in an 11-state region without incurring additional charges.¹⁸⁴ Cingular Wireless has five regional calling plans, as well as plans that allow subscribers to choose the areas that define the home-calling region.¹⁸⁵ Analysts believe these plans are designed to compete against regional competitors such as Powertel and Qwest Communications International, Inc. ("Qwest").¹⁸⁶ Leap, through its subsidiary Cricket, allows subscribers to make unlimited local calls and receive calls from anywhere in the world for one flat rate of \$30 per month. For a further discussion, see Section II.A.1.e, *infra*.

For the global traveler, AT&T Wireless and Nextel have come out with pricing plans that provide subscribers with one (terrestrial-based) mobile phone and one phone number worldwide. For an additional \$5 monthly fee to their domestic service plan, Nextel Worldwide subscribers can use their phones outside the United States and pay a flat rate per minute pricing based on the country from which they are calling.¹⁸⁷

Rates range from \$0.99 per minute for most of Europe; \$1.99 per minute for Asia, South America, and the Middle East; and \$2.99 - \$4.99 per minute for select countries in Africa, Eastern Europe and Southeast Asia. Nextel Worldwide customers access the service through a dual mode iDEN/GSM phone. AT&T Wireless's WorldConnect service costs an additional \$7.99 a month, plus a \$25 fee for an AT&T Wireless WorldConnect card.¹⁸⁸ Each call made or received while abroad is billed at a rate of \$0.99 per minute plus additional long distance charges based on the international zone in which the user is located.¹⁸⁹ AT&T Wireless WorldConnect subscribers must use a dual TDMA/GSM capable phone to access international services.¹⁹⁰

¹⁸² See Paul Kagan Associates, Inc., *National One-Rate Plans Take Off*, WIRELESS MARKET STATS, June 16, 2000, at 11.

¹⁸³ Deborah Mendez-Wilson, *Big Carriers Get Personal With Regional Calling Plans*, WIRELESSWEEK, Feb 26, 2001, at 12.

¹⁸⁴ Colorado, Wyoming, Utah, Arizona, New Mexico, Nevada, Idaho, Montana, California, Oregon, and Washington. *Verizon Wireless Debuts SingleRate West*, News Release, Verizon, Feb. 20, 2001.

¹⁸⁵ Deborah Mendez-Wilson, *Big Carriers Get Personal With Regional Calling Plans*, WIRELESSWEEK, Feb 26, 2001, at 12.

¹⁸⁶ *Id.*

¹⁸⁷ *Nextel Introduces Nextel Worldwide Service - Offers Convenience of One Phone, One Number, Worldwide*, News Release, Nextel, Apr. 3, 2000. Nextel Worldwide service was designed in response to a survey, sponsored by Nextel, that found that most business travelers do not use cell phones when they travel abroad. *Id.*

¹⁸⁸ AT&T Wireless, *AT&T WorldConnect* (visited Mar. 9, 2001) <http://www.attws.com/business/gov/explore/intl_calling/world_connect/>. The WorldConnect card allows the phone to work internationally.

¹⁸⁹ *Id.*

¹⁹⁰ *Id.*

(ii) Roaming

All mobile calling plans specify a calling area - such as a particular metropolitan area, the East Coast, or the entire United States - within which the subscriber can make a call without additional charges. When a subscriber exits this area, or “roams,” he or she incurs additional charges for each minute of use. Sometimes these roaming charges go directly to the subscriber’s carrier, and sometimes the charges are used to pay a carrier other than the subscriber’s, on whose network the subscriber was roaming.¹⁹¹ This source of revenue is particularly important to rural and smaller carriers.¹⁹²

Roaming rates have been declining, continuing the trend described in the *Fifth Report*.¹⁹³ One analyst estimates that the average per minute roaming rate for six large regional carriers declined by 18 percent, from \$0.43 in 1999 to \$0.36 in 2000.¹⁹⁴ US Cellular attributed a recent decline in its roaming revenue, in part, to a general decline in roaming rates throughout the industry.¹⁹⁵ The company expects the downward trend to continue as new wireless operators begin service in the company’s markets, and its roaming partners are able to switch their business to these new operators.¹⁹⁶ CTIA also reported the first year-over-year decline in roaming revenues for the mobile telephony industry since it began tracking the amounts in 1989, from \$4.1 billion at the end of 1999 to \$3.9 billion at the end of 2000.¹⁹⁷ CTIA attributes this to “increasingly large footprints of each carrier and wireless companies treating many calls as local, instead of

¹⁹¹ The fees that a carrier collects from non-subscribers using its network are called “outcollect” fees, and the fees that a carrier pays for its subscribers to roam on other networks are called “incollect” fees. Margo McCall, *Roaming Feeds Regional Carriers*, WIRELESS WEEK, Mar. 26, 2001, at 23.

¹⁹² For example, Dobson got 45 percent of its operating revenues through roaming charges in the third quarter of 2000. Dobson Communications Corp., SEC Form 10Q, Nov. 14, 2000, at 4. *See also*, Kelly Carroll, *Wireless: The Rural Way*, TELEPHONY, Jan. 1, 2001 (Rural Cellular Corp. states that “[r]oaming is critical for us”), available in 2001 WL 6907667; and Paul Kagan Associates, Inc., *In Spite of Rate Stepdowns, Roaming Still a Cash Cow for Rural Carriers*, WIRELESS TELECOM INVESTOR, Feb. 22, 2001, at 4 (showing roaming revenue as percentage of total revenues).

¹⁹³ *See Fifth Report*, at 17679.

¹⁹⁴ Linda J. Mutschler, *et al.*, *The Next Generation V: Wireless in the US*, Equity Research, Merrill Lynch, Mar. 9, 2001, at 9. Solomon Smth Barney also estimates 2000 roaming rates to be about the same (\$0.35). Michael Rollins, *et al.*, *Wireless by the Minute*, Salomon Smith Barney, Equity Research, Jan. 8, 2001, at 11. *See also*, Kelly Carroll, *Wireless: The Rural Way*, TELEPHONY, Jan. 1, 2001 (“roaming prices continue to decline”), available in 2001 WL 6907667. Verizon Wireless’s preliminary analysis of its roaming amounts payable and receivable between December 1999 and December 2000 showed a decline in roaming costs from between 5 and 64 percent. Verizon Wireless, Automatic and Manual Roaming Obligations Pertaining to Commercial Mobile Radio Services, *Comments*, WT Docket No. 00-193, at 4, *but see Id.*, at note 9. Corr Wireless Communications, LLC, a rural mobile telephony provider, claims that the rates it receives for roaming have been declining for years, and that its rates with Cingular Wireless fell to an all time low of \$0.25 per minute in 2000. Corr Wireless Communications, LLC, Automatic and Manual Roaming Obligations Pertaining to Commercial Mobile Radio Services, *Comments*, WT Docket No. 00-193, at 2.

¹⁹⁵ United States Cellular Corp., SEC Form 10-Q, Nov. 13, 2000, at 4.

¹⁹⁶ *Id.*

¹⁹⁷ *See Appendix C, Table 1*, at C-2.

roaming.”¹⁹⁸

Despite per minute reductions and the industry-wide fall in roaming revenues, declining roaming revenues is the exception for regional and rural carriers. In a recent study comparing the 1999 and 2000 roaming revenues of 12 such carriers, only the two largest carriers showed declines (US Cellular and ALLTEL).¹⁹⁹ The rest showed increases in roaming revenue, as roaming MOUs outpaced the decline in roaming rates for these companies.²⁰⁰

(iii) Prepaid Service

In the United States, most mobile telephony subscribers pay their phone bills after they have incurred charges (known as postpaid service). Prepaid service, in contrast, requires customers to pay for a fixed amount of minutes prior to making calls. One analyst estimated that approximately 11 percent of U.S. wireless phone users subscribed to prepaid plans at the end of 2000, up from 6 percent in 1999.²⁰¹ This contrasts sharply with the experience with prepaid wireless plans in Europe. According to one analyst’s estimates, prepaid users accounted for 79 percent of all new wireless customers in Western Europe in 2000, and now account for approximately 60 percent all wireless customers there.²⁰²

A large number of carriers now offer some form of prepaid plan, including Verizon Wireless, AT&T Wireless, BellSouth and SBC (individually, and not through Cingular Wireless),²⁰³ Sprint PCS, VoiceStream, ALLTEL, US Cellular, Centennial Communications Corp., CenturyTel, Inc., Cincinnati Bell Wireless, Dobson, Rural Cellular Corporation (“Rural Cellular”), TeleCorp, Triton PCS, Qwest, and Powertel.²⁰⁴ In addition, the unlimited local calling plans described in the Wireless/Wireline section below are all prepaid plans.

¹⁹⁸ *Wireless Subscribership Up 28% in Year 2000: CTIA releases Semi-Annual Wireless Industry Survey*, News Release, CTIA, Apr. 24, 2001.

¹⁹⁹ Paul Kagan Associates, Inc., *In Spite of Rate Stepdowns, Roaming Still a Cash Cow for Rural Carriers*, WIRELESS TELECOM INVESTOR, Feb. 22, 2001, at 4

²⁰⁰ *Id.*

²⁰¹ Johnathan Burns, *Tales Of The Tape: Prepaid Wireless A New Way Of Wireless*, DOW JONES NEWSWIRE, Jan. 29, 2001 (citing Knox Bricken of the Yankee Group). Another analyst estimated that 10 percent of users had prepaid plans. Elizabeth V. Mooney, *Prepaid rings up sales*, RCR WIRELESS NEWS, Jan. 22, 2001, at 20 (citing Michael Doherty of Ovum, Inc.). For 1999 percentage, see *Fifth Report*, at 17680.

²⁰² John Jensen, et al., *Mobile Matters: How Long Before the Present Stops . . . and the Future Begins?*, Equity Research, J.P. Morgan Securities, at 9-10. This is up from 51 percent in 1999. *Id.* One analyst suggests two main reasons for the greater number of prepaid subscribers in Europe: (1) European consumers are much more accustomed to prepaying for purchases; and (2) calling party pays enables prepaid wireless subscribers to use the phone for incoming calls without incurring any charges. Todd Rethemeier, *The Mobile Millennium – Wireless Telecommunications Services*, J.P. Morgan Securities, May 3, 2000, at 13. One analyst believes that if credit checks were illegal in the United States, as they are in Italy, prepaid would be much more common here: wireless operators would promote prepaid plans more aggressively if they were unable to exclude customers from their postpaid plans who had a history of non-payment of bills. Adam Zawel, *Prepaid Wireless Series, Part 4: The United States Just Doesn’t Get It . . . Yet*, The Yankee Group, June 2000, at 5, 8.

²⁰³ Ayse Ozgur Aytar, *The State of the U.S. Prepaid Market*, WIRELESSNOW GUEST COLUMN, Feb. 6, 2001.

²⁰⁴ Paul Kagan Associates, Inc., *Prepaid Proliferation*, WIRELESS MARKET STATS, May 18, 2000, at 2-4.

Powertel is particularly aggressive in the prepaid market. As of year-end 2000, Powertel reported that 54 percent of its subscriber base was on prepaid pricing.²⁰⁵ In the fourth quarter of 2000, 83 percent of Powertel's 104,000 new subscribers were prepaid.²⁰⁶

e. Wireless/Wireline Competition

According to a recent survey by the Yankee Group, about 3 percent of mobile telephone subscribers rely on their wireless phone as their only phone.²⁰⁷ While most wireless customers may not be willing to "cut the cord" just yet in the sense of canceling their subscription to wireline telephone service, it is indisputable that wireless service has significantly changed the way Americans communicate. Initially a business tool, wireless phones have become a mass-market consumer device. According to one survey, 77 percent of wireless customers said they use their phones primarily for personal calls.²⁰⁸ For some, wireless service is no longer a complement to wireline service but has become the preferred method of communication. In a survey performed for the Consumer Electronics Association, three in 10 wireless phone users stated they would rather give up their home telephone than their wireless phone.²⁰⁹ Among wireless users aged 18 to 34 years old, that figure rose to 45 percent.

In some areas, wireless use has begun to erode wireline revenue due to "technology substitution," that is, the substitution of new technologies for existing ones.²¹⁰ BellSouth, for example, stated in February 2001 that it was exiting the payphone business in part due to business lost to wireless phones.²¹¹ Twenty million

²⁰⁵ *Powertel, Inc. Announces Preliminary Fourth Quarter 2000 Financial Results*, News Release, Powertel, Feb. 1, 2001.

²⁰⁶ *Id.*

²⁰⁷ Judy Saries, *Wireless Users Hanging Up On Landline Phones*, NASHVILLE BUSINESS JOURNAL, Feb. 2, 2001. CTIA estimates that number could be as high as 5 percent, based on a February 2000 survey it sponsored. *Consumers Replacing Landline Phones with Wireless*, KNIGHT RIDDER/TRIBUNE BUSINESS NEWS, Jan. 10, 2001, available in 2001 WL 2837499.

²⁰⁸ *Majority of Customers Use Cell Phones for Personal Calls*, RCR WIRELESS NEWS, Jan. 29, 2001, at 29 (citing a survey conducted by Cellular One Group).

²⁰⁹ *Will Wireless Phones Make Traditional Home Telephones Obsolete?*, News Release, Consumer Electronics Association, Apr. 6, 2000.

²¹⁰ Andrew Backover, *AT&T Loss Reflects Long-Distance Shift Consumers Turn To Calling Cards, Wireless*, USA TODAY, Jan. 30, 2001, at B3. A similar term, "landline displacement," refers more specifically to the substitution of mobile phones for wireline phones. Deborah Mendez-Wilson, *Wireless Takes a Bite of Pay-phone Biz*, WIRELESSWEEK, Feb 12, 2001, at 5.

²¹¹ *BellSouth Announces Plans For Public Communications Unit*, News Release, BellSouth, Feb. 2, 2001. According to Charlie Coe, President of BellSouth Network Services, "BellSouth has carefully evaluated the market trends in the payphone business which indicate that our customers are opting for the new technology options we provide, including wireless telephones and interactive pagers." Industry insiders expect the payphone business to continue to shrink as wireless penetration increases. Deborah Mendez-Wilson, *Wireless Takes a Bite of Pay-phone Biz*, WIRELESSWEEK, Feb 12, 2001, at 5.

mobile telephone customers have service plans that do not charge extra for long distance,²¹² and at least one analyst believes that such plans are reducing wireline long distance minutes and revenues.²¹³ Another analyst estimates that 20 percent of all outbound wireless voice minutes are used for long distance.²¹⁴ AT&T blamed its fourth quarter 2000 \$1.7 billion loss in part on customers abandoning wireline long distance calls for wireless phones, e-mail and prepaid calling cards.²¹⁵ In one survey conducted in January 2000, 12 percent of respondents said they purchased a wireless phone instead of installing an additional wireline phone.²¹⁶

A few wireless carriers have begun offering service plans designed to compete directly with wireline local telephone service.²¹⁷ For example, Leap, through its Cricket subsidiary, now offers its Comfortable Wireless mobile telephone service in 12 markets, predominately in the South and Southwest.²¹⁸ At the end of 2000, Leap had more than 190,000 customers, up nearly nine-fold from the 22,000 customers reported at the beginning of the year.²¹⁹ Leap's service allows subscribers to make unlimited local calls and receive calls from anywhere in the world for one flat rate of \$30 per month.²²⁰ Roaming outside the local area is not available,²²¹ and customers pay extra for long distance calls.²²² According to Leap, about half of its customers view their phones as replacements for first or second lines,²²³ and about 7 percent of its

²¹² Andrew Backover, *AT&T Loss Reflects Long-Distance Shift Consumers Turn To Calling Cards, Wireless*, USA TODAY, Jan. 30, 2001, at B3.

²¹³ *Id* (citing analyst Peter Friedland at W.R. Hambrecht).

²¹⁴ Michael Rollins, *et al.*, *Wireless by the Minute*, Equity Research, Salomon Smith Barney, Jan. 8, 2001, at 8. Sprint PCS markets its nationwide digital wireless network as a long-distance alternative. Andrew Backover, *AT&T Loss Reflects Long-Distance Shift Consumers Turn To Calling Cards, Wireless*, USA TODAY, Jan. 30, 2001, at B3.

²¹⁵ Andrew Backover, *AT&T Loss Reflects Long-Distance Shift Consumers Turn To Calling Cards, Wireless*, USA TODAY, Jan. 30, 2001, at B3.

²¹⁶ Callie Nelson, *Replacing Landline with Wireless: How Far Can It Go?*, IDC, Dec. 2000 (citing IDC's *Personal Wireless Communications User Survey*, 2000).

²¹⁷ One analyst argues that recent price reductions give wireless price parity with wireline, at least at pricing around \$130 per month. See Daniel J. Berninger, *Telephony Unplugged: Wireless Achieves Price Parity with Wireline* (visited Mar. 8, 2001) <<http://slides.pulver.com/slides/login.asp>>.

²¹⁸ Leap, *Cricket* (visited Mar. 9, 2001) <<http://www.leapwireless.com/bcindex.html>>. Chattanooga, Nashville, Knoxville, and Memphis, TN; Charlotte and Greensboro, NC; Tulsa, OK; Tucson, AZ; Wichita, KS; Little Rock, AR; Albuquerque and Santa Fe, NM; and Salt Lake City, UT. Leap, *Cricket Service Areas* (visited Mar. 5, 2001) <<http://www.cricketcommunications.com/areas.asp>>. See also *Fifth Report*, at 17673.

²¹⁹ *Leap Reports Results for Fourth Quarter of Fiscal 2000*, News Release, Leap, Feb. 14, 2001.

²²⁰ The monthly fee varies slightly by service area.

²²¹ Roaming is not available even in other Leap markets. Leap, *Automatic and Manual Roaming Obligations Pertaining to Commercial Mobile Radio Services*, *Comments*, WT Docket No. 00-193, at 6.

²²² Leap, *Operating Companies* (visited Mar. 5, 2001) <<http://www.leapwireless.com/site/index.html>>.

²²³ S. Flannery, *Telecom - Wireline: What Are The Competitors Up To?*, Industry Report, Morgan Stanley, Dean Witter, Feb. 14, 2001, at 2 (citing Harvey White, Chairman and CEO of Leap Wireless International, Inc.).

customers in its Nashville and Chattanooga markets have dropped their wireline home phones altogether.²²⁴ In November 2000, Leap also claimed that 60 percent of its customers use their wireless phones as their primary phone.²²⁵

Leap's service plans seem to have encouraged its competition to develop similar offerings.²²⁶ In August 2000, US Cellular launched its flat-rate wireless plan, MetroZone, in a Leap market, Knoxville, Tennessee. US Cellular advertises MetroZone as an "alternative to traditional phone service or as a second line option."²²⁷ ALLTEL is test marketing its own "all-you-can-talk" local wireless service plan in five other markets where Leap has launched.²²⁸ The plan, known as Boomerang in Arizona and New Mexico, and MetroTalk in Arkansas and North Carolina, costs about \$30 per month.

In January 2001, Rural Cellular (through its subsidiary Unicel) began offering Go About Phone service. The Go About plan includes 3,000 minutes per month²²⁹ in the local calling area for about \$40 (long distance is extra). Rural Cellular calls its plan "another option for . . . primary and secondary phone lines."²³⁰

2. Other Competitors: Resellers and Satellite Operators

This section discusses two other types of operators that are competing in the mobile telephone segment: resellers and satellite operators.

a. Resellers

Resellers offer service to consumers by purchasing airtime at wholesale rates from facilities-based providers and reselling it at retail prices.²³¹ In 2000, the top 20 resale providers had just over 3 million

²²⁴ *Utah Residents Begin to Use Cell Phones as Primary Communications Device*, KNIGHT RIDDER/TRIBUNE BUSINESS NEWS, Feb. 5, 2001, available in 2001 WL 12166453.

²²⁵ Deborah Young, *Usurping Wired Services: Lofty Goal, But ...*, WIRELESS REVIEW, Nov. 1, 2000, available in 2001 WL 7119447.

²²⁶ As mentioned in the *Fifth Report*, Midwest Wireless had launched an unlimited local calling plan called Realm in four Minnesota communities in March 2000. See *Fifth Report*, at 17674.

²²⁷ *U.S. Cellular Launches MetroZone In Knoxville*, News Release, U.S. Cellular, Aug. 1, 2000.

²²⁸ Little Rock, AK; Charlotte and Greensville, NC; Tucson, AZ; and Albuquerque, NM. Deborah Mendez-Wilson, *Boomerang Bounces into Court*, WIRELESS WEEK, Feb. 5, 2001, at 5.

²²⁹ Cricket states that, on average, its customers use 1,000 minutes a month, a figure which the company claims is comparable to typical landline usage. Leap Wireless International, Inc. Request for Waiver and Extension of the Broadband PCS Construction Requirements of Commission Rule 24.203(a) and (b), FCC File No. 0000436815 (filed Apr. 26, 2001), at 2.

²³⁰ *Unicel Offers Landline Alternative: Unicel Go About Phone is the Mobile Phone That Reaches All Over Town*, News Release, Rural Cellular, Jan. 11, 2001.

²³¹ Interconnection and Resale Obligations Pertaining to Commercial Mobile Radio Services, *First Report and Order*, 11 FCC Rcd 18455, 18457 (1996).

subscribers, which is an increase of 100 percent over 1999.²³² WorldCom continues to be the largest reseller, with over 2 million customers, accounting for 65 percent of all the subscribers reported by the 20 largest resellers.²³³

b. Satellite Operators

In the past six years an increasing number of satellite operators have offered mobile services in the U.S., including Motient, TMI, Inmarsat, Iridium and Globalstar. Several of the companies have experienced financial difficulties during the past two years. Two companies, Iridium LLC. (Iridium”) which has an operating satellite system, and ICO Global Communications (“ICO”) which did not have a system in operation declared bankruptcy under Chapter 11 and emerged from bankruptcy in 2000. Another company, Globalstar Telecommunications LTD. (“Globalstar”) is currently offering service but failed to make certain debt payments in 2000. Five of these companies are briefly described below.

Iridium Iridium launched commercial mobile telephone service via satellite in November 1998.²³⁴ The company declared bankruptcy in August 1999,²³⁵ and discontinued service in March 2000.²³⁶ In August 2000, Motorola, which had been maintaining the Iridium system, began planning to decommission the system’s satellites.²³⁷ However, before the decommission schedule was finalized, Motorola (a major investor in Iridium), other Iridium investors, and the bankruptcy court entertained several bids for Iridium’s assets.²³⁸ In November 2000, they accepted a bid from a group of investors called Iridium Satellite LLC (“Iridium Satellite”) who offered to buy Iridium for \$25 million, including \$6.5 million in cash.²³⁹ On December 12, 2000, Iridium Satellite completed its acquisition of Iridium’s assets.²⁴⁰

²³² See Appendix C, Table 9, at C-8.

²³³ In November 2000, WorldCom announced plans to issue two tracking stocks for its businesses, “WorldCom” and “MCI” shares. Its “WorldCom” shares will reflect the performance of the assets of its wireless resale business. *WorldCom to Realign Businesses, Create Two Tracking Stocks*, News Release, WorldCom, Nov. 1, 2000.

²³⁴ *The World’s First Global Satellite Telephone and Paging Company Starts Service Today; Iridium Ushers in New Era of Global Communication*, News Release, Iridium, Nov. 1, 1998.

²³⁵ *Iridium Files for Chapter 11 Bankruptcy, Defaults on Bond Payment*, MOBILE SATELLITE NEWS, Aug. 19, 1999, available in 1999 WL 8217611.

²³⁶ *Motorola Readies Fall of Iridium Satellites; No Rescuer Found for Phone System*, CHICAGO TRIBUNE, Aug. 24, 2000, available in 2000 WL 3700414.

²³⁷ *Id.*; Hilary Smith, *Castle Harlan withdraws offer to salvage Iridium*, RCR RADIO COMMUNICATIONS REPORT, Aug. 7, 2000, available in 2000 WL 26131991.

²³⁸ Hilary Smith, *Iridium resurrection in the works*, RCR RADIO COMMUNICATIONS REPORT, Nov. 27, 2000, available in 2000 WL 26131991.

²³⁹ *Iridium’s Last Stand?*, MOBILE SATELLITE NEWS, Nov. 2, 2000, available in 2000 WL 9328211.

²⁴⁰ Iridium North America, *Homepage* (visited Jan. 4, 2001) <<http://www.iridiumusa.com>>.

Iridium Satellite reinitiated service at the end of March 2001.²⁴¹ Iridium Satellite expects mobile satellite service to cost about \$1.50 per minute, and handset prices will begin at \$950 for the Motorola handset.²⁴² At the time it reinstated mobile satellite service, Iridium Satellite had at least 20,000 users and \$3 million per month in revenues due to a two-year contract signed with the Department of Defense in December 2000.²⁴³ Iridium Satellite plans to target 30,000 former Iridium customers to renew service contracts.²⁴⁴ Former customers will be offered free software upgrades for their phones along with other promotions the company is formulating.²⁴⁵ Iridium Satellite officials have expressed optimism about their chances for success, pointing to relatively low operating costs and a low break-even mark.²⁴⁶

ICO ICO emerged from bankruptcy in May 2000 following a \$1.2 billion investment led by Craig McCaw.²⁴⁷ The new company is named New ICO Global Communications Ltd. (“New ICO”), and it plans to merge with Teledesic Corporation, a broadband data satellite services company owned by Craig McCaw.²⁴⁸ The two companies will become subsidiaries of the holding company ICO Teledesic Global Ltd., which is already a controlling shareholder of New ICO.²⁴⁹ New ICO plans to market mobile and fixed satellite voice and data services by delivering high-speed services such as wireless Internet access.²⁵⁰ New ICO’s network will consist of 12 satellites.²⁵¹ Recently, New ICO asked the Commission to permit it to use

²⁴¹ *Iridium Satellite LLC Launches Global Communications Services*, News Release, Iridium Satellite, Mar. 28, 2001.

²⁴² Iridium Satellite does not set the price for per minute mobile satellite service. Pricing plans are set by Iridium Satellite’s wireless partners, and Iridium Satellite expects its wireless partners to charge as low as \$1.50 per minute. Motorola has agreed to continue manufacturing handsets for Iridium Satellite. Motorola plans to release an upgraded phone in July 2001 that will cost about \$1,495. *Iridium Is Expected to Announce Relaunch of Mobile-Phone Service*, THE WALL STREET JOURNAL, Mar. 28, 2001. *Transcript of a conference call regarding Iridium Satellite LLC*, FITZGERALD COMMUNICATIONS, Dec. 12, 2000.

²⁴³ Malcolm Spicer, *Iridium Satellite Lands Defense Contract*, CT WIRELESS, Dec. 7, 2000, available in 2000 WL 6392736.

²⁴⁴ *Transcript of a conference call regarding Iridium Satellite LLC*, FITZGERALD COMMUNICATIONS, Dec. 12, 2000.

²⁴⁵ *Id.*

²⁴⁶ Dan Colussy, Chairman of Iridium Satellite, said operating costs are \$7 million per month. Colussy also expects Iridium Satellite will be able to break even with approximately 60,000 subscribers, about the same number of subscribers Iridium had when the company shut down its system. *Transcript of a conference call regarding Iridium Satellite LLC*, FITZGERALD COMMUNICATIONS, Dec. 12, 2000.

²⁴⁷ Michael J. Martinez, *Teledesic, ICO To Merge*, AP ONLINE, May 17, 2000.

²⁴⁸ *Id.*

²⁴⁹ *ICO-Teledesic Global Announces Investment Agreements Totaling More Than \$1 Billion*, News Release, Teledesic Corporation, Jul. 11, 2000.

²⁵⁰ New ICO Global Communications Ltd., SEC Form S-4, Sept. 20, 2000, at 91.

²⁵¹ *Id.*

its spectrum to provide a terrestrial service that would be ancillary to and serve its satellite network.²⁵² New ICO states that it needs this authority in order to provide service inside buildings and in certain urban areas in order to operate a viable business.²⁵³

Globalstar In February 2000, Globalstar initiated commercial mobile voice service via satellite and was the only satellite carrier providing such service as of year-end 2000. Globalstar had about 31,000 subscribers as of year-end 2000, and about \$3.7 million in revenue over the course of the year.²⁵⁴ Analysts and Globalstar management agree that the company will be unable to generate profits until it has close to one million subscribers.²⁵⁵ To attract customers, Globalstar has offered several promotions throughout the year and cut prices for both its phones and service.²⁵⁶ Its mobile satellite phones, manufactured by QUALCOMM, Inc. retail for approximately \$1,200, but when offered as part of a promotion, can cost as low as \$800.²⁵⁷ Per month service charges range from \$24.95 with zero minutes to \$499.95 for 500 minutes. Additional minutes cost between \$0.99 and \$1.69, depending on the service plan chosen.²⁵⁸ Globalstar has nearly 20 distributors of its products and services in the United States.²⁵⁹

During the second half of 2000, Globalstar experienced financial difficulties. In June, Globalstar failed to

²⁵² New ICO made a request in March 2001 for the Commission to grant it the authority to install and connect its satellite system to a terrestrial cellular network. This request would require the Commission to amend the 2 GHz spectrum rules for MSS operators. Bruce Branch, *McCaw Creates Stir By Asking FCC For Terrestrial Spectrum*, COMMUNICATIONS DAILY, Apr. 4, 2001, available in 2001 WL 5052893; Barnaby J. Feder, *Satellite Venture Seeks Right To Offer Land-Based Service*, NEW YORK TIMES, Apr. 2, 2001, at C-2.

²⁵³ New ICO, *Quick Facts* (visited Jan. 19, 2001) <<http://www.icoglobal.net/press/facts/index.html>>.

²⁵⁴ *Globalstar Reports Fourth Quarter and Year-End Results*, News Release, Globalstar, Apr. 2, 2001.

²⁵⁵ Andy Pasztor, *Globalstar Suspends Payments on Debt, Plans to Pursue 'Strategic Alternatives'*, THE WALL STREET JOURNAL, Jan. 17, 2001, at A-16; Amy Hellickson, *Globalstar Shares Plunge as Customers Fall Short*, BLOOMBERG, Oct. 13, 2000; *Satellite communications: Lost in space*, THE ECONOMIST, Nov. 4, 2000. Analysts predictions about Globalstar's break-even point vary slightly. William Kidd, an analyst with C.E. Unterberg, Towbin, says 770,000 customers are needed, while Marc Nabi, an analyst with Merrill Lynch, claims the break-even point is 1.6 million customers.

²⁵⁶ *Globalstar USA To The Rescue Of Iridium Customers Left Holding The Phone:Distributors Offer Trade-in Rebates for Iridium Phones*, News Release, Globalstar, Mar. 16, 2000; *Globalstar Slashes Airtime, Hardware Costs*, WIRELESSNOW, Mar. 27, 2000; *Spring Forward With Globalstar USA: Limited Promotional Rates; Introducing Beyond 50 Minute Plan*, News Release, Globalstar, Mar. 31, 2000; *Globalstar Discounts U.S. Prices*, WIRELESSNOW, Jul. 17, 2000; *Globalstar USA Announces "Time or Money" Promotion*, News Release, Globalstar, Oct. 16, 2000.

²⁵⁷ Peter H. Lewis, *E-Mail At Full Sail, Via Satellite Phone And Laptop*, FORTUNE MAGAZINE, Jan. 22, 2001, available in 2001 WL 2172246.

²⁵⁸ Globalstar, *Globalstar Pricing and Promotions* (visited Jan. 18, 2001) <<http://www.globalstarusa.com/pricing>>.

²⁵⁹ Globalstar, *Globalstar USA : Our Distributors* (visited Jan. 18, 2001) <<http://www.globalstarusa.com/dealer>>.

repay a \$250 million loan, forcing guarantor Lockheed Martin Corporation to make the debt payment.²⁶⁰ In September, Globalstar received a \$56 million equity investment followed by \$105 million in a stock purchase plan with Bear, Stearns International Ltd. (“Bear Stearns”).²⁶¹ Despite these new funds from Bear Stearns, Globalstar suspended its debt payments in January 2001.²⁶²

Inmarsat Inmarsat, offers mobile communications services including telephony, telex, fax, electronic mail, position reporting and disaster communications.²⁶³ They are currently authorized to provide some types of international telephony service to and from the U.S. and to provide maritime mobile service, although they are not currently authorized to provide domestic U.S. telephony service. An application to do so is pending before the Federal Communications Commission.

Motient Motient, formally known as American Mobile Satellite Corporation, was founded in 1988. Among other services, Motient currently offers satellite telephone data and fax service and satellite dispatch services.²⁶⁴ TMI Communications, located in Ottawa, Canada and Motient have announced their intent to merge and create a new entity named Mobile Satellite Ventures.²⁶⁵ Although TMI is a Canadian company, it has received two blanket earth station licenses from the FCC to provide service to mobile terminals located in the United States. As part of their application to the FCC to authorize the transfer related to the merger, the applicants have requested authority to operate terrestrial base stations in the same band as their satellite service.²⁶⁶

²⁶⁰ Bruce Branch, *\$250 Million Repaid: Lockheed Martin Forced to Pay Globalstar Loan Guarantee*, COMMUNICATIONS DAILY, Jul. 5, 2000, available in 2000 WL 4695709. In August, Merrill Lynch released a report warning that Globalstar “could face liquidity issues” in the first half of 2001. Marc E. Nabi, *et al.*, *Globalstar Telecommunications Ltd.*, Merrill Lynch, Aug. 1, 2000, at 5.

²⁶¹ Michael Rapoport, *Globalstar-Bear Stearns Deal Still Puzzles*, DOW JONES NEWSWIRE, Oct. 13, 2000.

²⁶² Globalstar Telecommunications Ltd., SEC Form 8-K, Jan. 16, 2001. The company has \$195 million in cash left for operations. Some analysts believe the company will soon declare bankruptcy, following the paths of Iridium and ICO. William Kidd, *et al.*, *Satellite Communications 2001 Outlook & Investment Guide: Fluid Times Require Long-Term Direction*, C.E. Unterberg, Towbin, Jan. 22, 2001, at 121; William Kidd, *et al.*, *Globalstar Defaults on Debt Payments and Looks to Restructure*, Satellites, C.E. Unterberg, Towbin, Jan. 16, 2001; Bruce Branch, *Globalstar Reorganizes Finances by Suspending Payments*, COMMUNICATIONS DAILY, Jan. 17, 2001; Andy Pasztor and Jeff Cole, *Loral Chief Bernard Schwartz Seeks One More Feat: Salvaging Globalstar*, THE WALL STREET JOURNAL, Jan. 26, 2001 (“Globalstar is ‘surviving on the kindness of others’ because bondholders could push it into bankruptcy proceedings at any time, [Bernard Schwartz] notes.”).

²⁶³ Robert B. Kaimowitz, *et al.*, *The Satellite Communications Industry, Efficient Infrastructure 2000*, ING Barings, Mar. 2000 at 127. Inmarsat, *Inmarsat Homepage* (visited May 29, 2001) <<http://www.inmarsat.com/welcome.html>>.

²⁶⁴ Motient, *Products and Services* (visited May 29, 2001) <http://www.motient.com/Content/Products_Services/products_services.htm>.

²⁶⁵ William Kidd, *et al.*, *Hotbird*, C.E. Unterberg, Towbin, Mar.12, 2001 at 40.

²⁶⁶ Application filed by Motient Services Inc. and Mobile Satellite Ventures Subsidiary LLC for Assignment of Licenses and Authority to Launch and Operate a Next-Generation Mobile Satellite Service System (March 1, 2001).

3. International Developments

a. Foreign Investment in U.S. Mobile Operators

U.S. mobile telecommunications companies continued to form alliances with their foreign counterparts during 2000. In a series of transactions completed in the first half of 2000, Bell Atlantic Corp., GTE Corp., and Vodafone combined their cellular and broadband PCS licenses into a single company, Verizon Wireless.²⁶⁷ Verizon (the company resulting from the combination of Bell Atlantic Corp. and GTE Corp.) owns 55 percent of Verizon Wireless, and Vodafone owns 45 percent.²⁶⁸ In July 2000, Germany's Deutsche Telekom announced an agreement to acquire VoiceStream.²⁶⁹ Also, in August 2000, Deutsche Telekom and Powertel entered into a separate agreement for Deutsche Telekom to acquire Powertel.²⁷⁰ The mergers closed on May 31, 2001, following the Commission's approval of the parties' request to transfer control of licenses and authorizations held by VoiceStream and Powertel to Deutsche Telekom.²⁷¹

Another notable foreign entry into the U.S. mobile market in 2000 was the acquisition by Japan's NTT DoCoMo, Inc. ("NTT DoCoMo") of an approximate 16 percent stake in AT&T Wireless.²⁷² NTT DoCoMo's investment in AT&T Wireless cemented the formation of a strategic alliance to develop the next generation of mobile multimedia services on a global-standard, high-speed wireless network. NTT DoCoMo is the largest mobile service provider in Japan, with over 50 percent of the mobile market. DoCoMo's i-mode, a wireless data service launched in February 1999, had attracted 21.7 million subscribers, or more than 18 percent of the population, as of March 30, 2001.²⁷³

b. U.S. Investment in Foreign Mobile Operators

U.S. mobile telephone operators started the year 2000 with a large portfolio of investments in foreign mobile telephone companies.²⁷⁴ While this portfolio remains largely intact, a few foreign holdings were divested in the course of the year. For example, SBC reached agreements in 2000 to sell off its ownership

²⁶⁷ See *Fifth Report*, at 17670.

²⁶⁸ *Id.*

²⁶⁹ *Id.*, at 17671.

²⁷⁰ Applications of VoiceStream Wireless Corporation, Powertel, Inc., and Deutsche Telekom AG, for Consent to Transfer Control of Licenses and Authorizations, *Memorandum Opinion And Order*, FCC 01-142 (rel. Apr. 27, 2001), at ¶10.

²⁷¹ *FCC Approves Deutsche Telekom/VoiceStream/Powertel Request to Transfer Control of Licenses*, News Release, Federal Communications Commission, Apr. 25, 2001; *Deutsche Telekom Completes Acquisitions of VoiceStream Wireless Corporation and Powertel, Inc. and Reports Merger Considerations*, News Release, Deutsche Telekom, May 31, 2001.

²⁷² *AT&T and NTT DoCoMo Announce Strategic Wireless Alliance*, News Release, AT&T, Nov. 30, 2000; *AT&T Wireless and NTT DoCoMo Commence Strategic Wireless Alliance*, News Release, AT&T, Jan. 22, 2001.

²⁷³ NTT DoCoMo, *Increase of Subscriber Number of iMode* (visited May 15, 2001) <http://www.nttdocomo.com/i/i_m_scr..html>.

²⁷⁴ See Appendix C, Table 10, at C-9, for a summary of U.S. operators' foreign holdings.

stakes in Swiss mobile operator diAx and Norwegian mobile operator NetCom.²⁷⁵

In addition, following NTT DoCoMo's acquisition of a minority stake in AT&T Wireless, AT&T agreed to divest its 10 percent interest in Japan Telecom by selling this interest to UK-based mobile operator Vodafone.²⁷⁶ Japan Telecom is the principal shareholder (54 percent) in J-Phone, which as Japan's third largest mobile service provider competes directly with NTT DoCoMo. AT&T's 10 percent stake in Japan Telecom had been part of a 30 percent interest that AT&T held jointly with its global joint venture partner British Telecommunications.

The 3G licensing process in Europe afforded new opportunities for U.S. mobile telecommunications companies to gain entry to the European mobile market in 2000. To date, thirteen countries in Western Europe have awarded licenses for 3G services. In order to ensure that one or more new operators enter the market, the majority of Western European countries (including the United Kingdom, Germany, Italy, Austria, Spain, Switzerland, Norway, Sweden, and Portugal) have awarded at least one more license than the number of incumbent mobile operators.

Despite the opportunities afforded to new entrants, U.S. telecommunications companies without ownership stakes in incumbent European mobile operators participated only to a limited extent in 3G licensing in Europe and were unsuccessful in winning licenses in the European 3G markets in which they did compete. For example, WorldCom Wireless (UK) Limited ("WorldCom UK"), a wholly owned subsidiary of WorldCom, was one of nine new entrants and thirteen companies in total to bid for the five 3G licenses offered for auction in the United Kingdom. However, intense competition drove license prices to record-breaking levels, causing WorldCom UK to drop out before the auction concluded. Subsequently, both WorldCom and Talkline, a joint venture of SBC and TeleDanmark, withdrew from participation in the German 3G auction partly to avoid a repetition of the intense bidding competition and high license prices generated by the British auction. While bidding competition and license prices were much lower in the remaining European 3G auctions, U.S. companies made no attempt to participate in these auctions as new entrants.

Only U.S. companies with ownership stakes in incumbent European mobile operators have succeeded so far in winning pieces of the new 3G licenses awarded by European governments. Winners of 3G licenses with equity participation by U.S. companies include E-Plus Hutchison in Germany (BellSouth has a 22.5 percent ownership interest in venture partner E-Plus), Omnitel in Italy (Verizon has a 23.1 percent interest), and Belgacom Mobile in Belgium (SBC owns 17.5 percent of Belgacom S.A.). In addition, SBC indirectly owns portions of 3G license winners 3G Blue in the Netherlands, dSpeed in Switzerland, and Connect Austria through its ownership stakes in TeleDanmark (41.6 percent) and Belgacom S.A. (17.5 percent). Both Belgacom and TeleDanmark are partners in a joint venture (with Deutsche Telekom and Dutch incumbent Ben) that owns 3G Blue, while TeleDanmark owns a controlling stake in dSpeed and is a partner in a consortium (with Viag Interkom, Orange, and Telenor) that owns Connect Austria.

U.S. companies have been more successful in expanding their presence in South America than in Europe.

²⁷⁵ Emily Bourne, *Bidders Line Up for Norwegian 3G Licenses*, TOTAL TELECOM, Aug. 14, 2000; Anne Young, *Swiss UMTS Auction is Postponed as Five Become Four*, TOTAL TELECOM, Nov. 13, 2000.

²⁷⁶ Thorold Barker, *Vodafone Pays \$1.35bn to Up Japan Telecom Stake*, FINANCIAL TIMES, Feb. 26, 2001; *Vodafone Set to Expand Japan Stake-AT&T to Sell 10 percent of Japan Telecom in \$1.35 Billion Deal*, THE WALL STREET JOURNAL, Feb. 26, 2001, at A14; Richard Waters, *Vodafone Eyes Japan Stake*, FINANCIAL TIMES, Feb. 25, 2001.

For example, in February 2001 Swedish operator Telia and Telecom Americas - a consortium of SBC (11.4 percent), Bell Canada International (44.3 percent), and America Movil (44.3 percent) - reached an agreement in principle whereby Telia will sell its financial interests in Brazilian mobile operator Tess S.A. ("Tess") to Telecom Americas.²⁷⁷ Acquisition of Tess, which holds a regional PCS license for Sao Paulo interior, will expand Telecom Americas' footprint in Brazil, where its holdings include Algar Telecom Leste, a Rio de Janeiro mobile operator in which SBC and Telmex jointly own a 25 percent stake. Some analysts have predicted that Telecom Americas will likely merge its Brazilian mobile assets with those of BellSouth, which currently operates PCS networks in metropolitan Sao Paulo and a group of northeastern states.²⁷⁸

c. International Comparisons

As in 1999, rapid growth of mobile subscribership in the mobile telephone markets of Western European countries continued in the year 2000. With the addition of approximately 90 million new subscribers, the number of mobile subscribers in Western Europe grew by 58 percent to nearly 245 million in 2000.²⁷⁹ Mobile penetration in Western Europe averaged 62.5 percent as of December 31, 2000, up from 40 percent at the end of 1999.²⁸⁰

Differences in the penetration rates of individual countries narrowed slightly as mobile subscribership tended to grow more rapidly in countries with below-average penetration rates than in countries that had already achieved the world's highest penetration rates. At the end of 1999, for example, Finland had Europe's (and the world's) highest penetration rate at 65 percent, while Germany's 28 percent penetration rate was the lowest in Western Europe.²⁸¹ By the end of 2000, Germany's penetration rate had climbed by more than 30 percentage points to 58.1 percent, the largest penetration gain in Western Europe for the year.²⁸² In contrast, Finland had the smallest penetration gain (7.5 percent) in Western Europe during 2000, giving it an end-year penetration rate of nearly 73 percent.²⁸³ Norway overtook Finland as the Western European country with the highest penetration rate in 2000 (81.2 percent), while France had the lowest penetration rate (50 percent).²⁸⁴ Thus, the ratio between the highest and the lowest penetration rate in Western Europe was approximately 1.6 (81:50) at the end of 2000, down from approximately 2.3 (65:28) at the end of 1999.

The addition of prepaid subscriptions appears to have been the major driver of mobile subscriber growth in

²⁷⁷ *Telia to Sell Mobile Operator Tess (Brazil) to Telecom Americas*, News Release, Telia, Feb. 13, 2001.

²⁷⁸ Jonathan Karp, *Wireless Rivals Rewire Things in Brazil*, THE WALL STREET JOURNAL, Jan. 25, 2001, at A14.

²⁷⁹ John Jensen, *et al.*, *Mobile Matters*, Equity Research, J.P. Morgan Securities, Mar. 2001, at 6.

²⁸⁰ Fanos Hira, *et al.*, *The Cellular Review*, Equity Research, Bear Stearns, Feb. 2001, at 21. The average penetration rate for the end of 1999 is taken from the *Fifth Report*, at 17684.

²⁸¹ *Fifth Report*, at 17684.

²⁸² Fanos Hira, *et al.*, *The Cellular Review*, Equity Research, Bear Stearns, Feb. 2001, at 21-22.

²⁸³ *Id.*

²⁸⁴ *Id.*

Western Europe in 2000. Prepaid users accounted for an estimated 79 percent of new subscribers in Western Europe in 2000, and as of September 2000 represented 58 percent of all Western European mobile phone users, up from 51 percent at the end of 1999.²⁸⁵ The market share of prepaid users in individual countries varies widely, ranging from a high of 84 percent of all users in Italy to a low of 34 percent in Switzerland as of September 2000.²⁸⁶ Germany's mobile boom in 2000 was heavily driven by growth in prepaid subscribers, with the share of prepaid subscribers in the total subscriber base rising from 22 percent at the end of 1999 to 45 percent in September 2000.²⁸⁷ In contrast, France, with the lowest mobile penetration rate, had a relatively low share of prepaid subscribers, estimated at 43 percent as of September 2000.²⁸⁸ In addition, prepaid subscribers have never been a particularly important driver of mobile subscriber growth in Finland because of low fees for contract subscribers.²⁸⁹

The growing importance of prepaid users in European mobile subscriber growth is linked to recent reports casting doubt on the reliability of industry subscriber figures for Western Europe. Because prepaid phones do not require customers to sign monthly contracts or make monthly payments, prepaid users are difficult for operators to track. Reports suggest that industry subscriber figures may contain a certain level of "double counting" due in part to the large number of mobile phones purchased by prepaid users simply to replace existing handsets and to take advantage of handset subsidies.²⁹⁰ Carphone Warehouse, Europe's largest mobile phone retailer, estimates that as many as 75 percent of phones purchased recently in its London stores represent replacements rather than new customers.²⁹¹

Operators try to adjust their subscriber totals to allow for customer upgrades by excluding handsets not used for a certain period, but there is no agreed standard among operators regarding the period of time to use. In the United Kingdom, Orange, France Telecom's UK subsidiary, excludes prepaid customers after three months of inactivity.²⁹² In March 2001 the UK's Vodafone announced plans to follow Orange by ignoring any customers who had not used their phones for more than three months.²⁹³ However, BT Cellnet counts customers who have not used their phones for up to six months, and One2One, the UK subsidiary of Germany's Deutsche Telekom, counts customers even if they have not made a call for a year.²⁹⁴ Mobile phone retailers believe that even a three-month cut off period is too generous because few new users are likely to remain silent for more than a few weeks.²⁹⁵

²⁸⁵ John Jensen, *et al.*, *Mobile Matters*, Equity Research, J.P. Morgan Securities, Mar. 2001, at 9.

²⁸⁶ *Id.*, at 10.

²⁸⁷ *Id.*

²⁸⁸ *Id.*

²⁸⁹ *Id.*

²⁹⁰ Dan Roberts, *UK Mobile Users Overstated*, FINANCIAL TIMES, Apr. 16, 2001; Reuters staff, *Vodafone Says Figures Overstate Mobile Ownership*, TOTAL TELECOM, Mar. 14, 2001.

²⁹¹ Dan Roberts, *Carphone Contests Mobile Phone Growth Rates*, FINANCIAL TIMES, Apr. 8, 2001.

²⁹² *Id.*

²⁹³ Dan Roberts, *UK Mobile Users Overstated*, FINANCIAL TIMES, Apr. 16, 2001.

²⁹⁴ Dan Roberts, *Carphone Contests Mobile Phone Growth Rates*, FINANCIAL TIMES, Apr. 8, 2001.

²⁹⁵ *Id.*

Estimates of the level of double counting vary. Vodafone initially estimated that its total UK subscriber figures might fall by around nine percent as a result of its decision to exclude any customers who had not used their phones for more than three months.²⁹⁶ Subsequently, Vodafone released figures that showed inactivity levels of 12 percent in the UK, 13 percent in Germany, and 7 percent in Italy.²⁹⁷ However, independent research on mobile phone use in the UK suggests that industry subscriber figures may overstate the number of mobile subscribers by as much as 25 percent.²⁹⁸ Based on a poll of 4,000 people conducted in December 2000, the Gartner Group estimated that only 30 million residents, or 63 percent of adults, used mobile phones in the UK.²⁹⁹ In contrast, industry figures showed there were more than 40 million active users in the UK at that time, equivalent to 90 percent of adults.

The *Fifth Report* observed that the most prominent difference between the U.S. and Western European mobile telephone markets is that Western European markets are achieving greater penetration levels and higher average penetration growth than the U.S. market.³⁰⁰ Despite rapid growth in U.S. mobile subscribership in the intervening period, the Western European markets continued to achieve greater mobile penetration levels than the U.S. in the year 2000, and by a wider margin than at the end of 1999. As noted previously, the United States finished the year 2000 with a mobile penetration level of approximately 39 percent, as compared with the Western European average of 62.5 percent. The ratio of the average Western European mobile penetration level to the U.S. penetration level was 1.6 at the end of 2000, up from 1.25 at the end of 1999. While two of the Western European countries, Germany and Belgium, had lower penetration levels than the United States at the end of 1999, both Germany and Belgium, along with all other Western European countries, finished the year 2000 with higher penetration levels than the United States.

The mobile telephone markets of advanced industrialized countries in the Asian-Pacific region are also achieving greater penetration levels than the U.S., but the difference is not as significant. At the end of 2000, Japan had a mobile penetration rate of 45.7 percent, up from 37 percent at the end of 1999.³⁰¹ Australia and New Zealand finished the year 2000 with penetration rates of 53.3 percent and 51.4 percent, respectively.³⁰² Thus, even compared with the Asian-Pacific mobile telephone markets, the mobile penetration levels achieved in Western Europe appear to be relatively high.

Given current penetration levels, analysts predict that subscriber growth will slow in Western Europe during 2001 and 2002. One group of analysts projects subscriber growth in Western Europe to decelerate to 20 percent in 2001 and 11 percent in 2002, with only around 50 million new subscribers in 2001.³⁰³

²⁹⁶ Dan Roberts, *User Figures Haunt Vodafone*, FINANCIAL TIMES, Apr. 17, 2001; Reuters staff, *Vodafone Says Figures Overstate Mobile Ownership*, TOTAL TELECOM, Mar. 14, 2001.

²⁹⁷ FT.com staff, *Vodafone Users Spend Less*, FINANCIAL TIMES, Apr. 25, 2001.

²⁹⁸ Dan Roberts, *UK Mobile Users Overstated*, FINANCIAL TIMES, Apr. 16, 2001.

²⁹⁹ *Id.*

³⁰⁰ *See Fifth Report*, at 17683.

³⁰¹ *Cellular Telephone Subscription by Country*, ASIACOM, Mar. 6, 2001, at 7.

³⁰² *Id.*

³⁰³ John Jensen, *et al.*, *Mobile Matters*, Equity Research, J.P. Morgan Securities, Mar. 2001, at 13.

This projected slowdown in European mobile subscriber growth, together with continued steady, or possibly even accelerated, U.S. mobile subscriber growth during this period, is expected to narrow the difference between penetration levels in the U.S. and Western Europe.³⁰⁴

Already there have been signs that this predicted slowdown was starting to occur in the first half of 2001. The UK's Vodafone, the world's largest mobile operator, reported a sharp slowdown in subscriber growth figures for the first quarter of 2001, particularly in Germany and Italy, which previously had been among its strongest markets.³⁰⁵ In Germany, Vodafone's subsidiary added 1.6 million subscribers in the first quarter of 2001, compared with about 2.7 million in each of the three previous quarters.³⁰⁶

Based on forecasts of average MOUs for the end of 2000, the *Fifth Report* further observed that U.S. subscribers are using their mobile phones more intensively than European subscribers.³⁰⁷ This conclusion has been validated by actual estimates of MOUs for the end of 2000. According to one such estimate, average MOUs in Western Europe dropped to 140 minutes per subscriber per month in 2000, down 2 percent from 144 minutes in 1999.³⁰⁸ This compares with a range of estimates of MOUs in the U.S. during 2000 that taken together average 303 minutes per subscriber per month.³⁰⁹ Because prepaid subscribers tend to use their mobile phones much less than contract customers, the relatively high share of prepaid users in the Western European subscriber base pulls down estimates of average mobile usage. Thus, mobile phone usage by contract customers in Western Europe averages 209 minutes per month, whereas prepaid users talk for only 59 minutes per month on average.³¹⁰ In the United Kingdom, operator Orange's "bucket plans" encourage its contract customers to use their mobile phones for an estimated 303 minutes per month, as compared with an average of 68 minutes per month for UK Orange's prepaid subscribers.³¹¹

While a higher percentage of the population in Western Europe and Japan currently subscribes to mobile telephone service, estimates of the cost of a "basket" of mobile services suggest that certain classes of users may be paying less for mobile telephone service in the United States. Using a methodology that has been approved by the Organization for Economic Cooperation and Development ("OECD") as the official OECD basket methodology, Teligen has developed a pair of baskets representing two usage profiles, one for business users and the other for residential users (personal use).³¹² The business basket has a much higher call volume than the residential basket, among other differences. The prices for each basket are taken

³⁰⁴ John M. Bensch, *et al.*, *U.S. Spectrum Auction Guide*, Equity Research, Lehman Brothers, Feb. 14, 2001, at 6, 8.

³⁰⁵ Dan Roberts, *Vodafone Signals Saturation*, FINANCIAL TIMES, Apr. 5, 2001.

³⁰⁶ *Id.*

³⁰⁷ *Fifth Report*, at 17684.

³⁰⁸ John Jensen, *et al.*, *Mobile Matters*, Equity Research, J.P. Morgan Securities, Mar. 2001, at 22. This estimate of average MOUs in Western Europe includes only voice and not SMS or other mobile data services. *Id.*

³⁰⁹ See Section II.A.1.b(ii), Minutes-of-Use, *supra*.

³¹⁰ Fanos Hira, *et al.*, *Orange*, Equity Research, Bear Stearns, Apr. 26, 2001, at 17.

³¹¹ *Id.*

³¹² *T-Basket – Telecommunications Cost Indicators Using the OECD Basket Methodology*, Teligen Limited, Feb. 2001.

from a selected calling plan of a single operator, and the two baskets are updated on a quarterly basis with the latest available prices for the calling plan.³¹³ Based on prices as of February 1, 2001, Teligen's business basket estimates show that the cost of mobile service to business users in the United States is well below the average for Western Europe.³¹⁴ However, Teligen's residential basket estimates suggest that the cost of mobile service for personal use in the United States during the same time period is above the Western European average.³¹⁵

The World Bank has likewise built models for the purpose of comparing the price of wireless communications services in the United States, Europe, and emerging markets. The comparisons are limited to a selection of highly competitive local markets, mainly very large or capital cities such as London, Milan, New York, and Washington. The models are based on the assumption that the customer always chooses the best (least-cost) pricing scheme for a certain bundle of minutes. For example, one model takes a selection of U.S. and international wireless operators and calculates how much increments of 10 minutes of use would cost a subscriber to each of the operators over a wide range of minutes of use per month. The results of the World Bank's models show that U.S. wireless providers are the cheapest for virtually every class of user (more than 90 percent of the user classes selected), rather than just business users.³¹⁶

³¹³ Some countries, including the United States, are represented by two residential and business baskets apiece, each basket corresponding to a different operator's calling plan. In the case of the United States, Teligen uses prices from Sprint PCS Free & Clear 180 Plan and Qwest's Standard 150 plan. In addition, while most of the calling plans for other countries include rates for local, national, and international service, the rates for the two U.S. calling plans are valid for local service in the Washington, D.C. (Sprint PCS) and the Denver, Colorado (Qwest) areas only.

³¹⁴ *Id.*

³¹⁵ *Id.*

³¹⁶ Conversations with Carlo Maria Rossotto, Regulatory Economist, World Bank (Jan. 30, 2001 and Feb. 9, 2001).

B. Mobile Data

1. Introduction

a. Domestic Developments

Mobile data service is the delivery of non-voice information to a mobile device. Mobile data service includes everything from paging messages to web access on a mobile phone to e-mail delivery. This report divides current mobile data offerings into four categories or sub-sectors, all of which are discussed below. The first category is traditional one-way paging and advanced messaging services offered by paging/messaging carriers using paging and narrowband PCS spectrum. The second category consists of mobile data services,³¹⁷ such as wireless web,³¹⁸ e-mail, and SMS,³¹⁹ provided by mobile telephone operators using cellular, broadband PCS, and SMR spectrum. The third category is data services offered over handheld PDA³²⁰ devices with a mobile Internet connection, either through a built-in wireless modem or with the attachment of a wireless modem card, an advanced messaging device, or a mobile phone. The fourth category is mobile data services provided by dedicated data network operators. Currently, there are three major companies that operate dedicated data networks: Motient Corporation (“Motient”), Cingular Interactive, Inc. (“Cingular Interactive,” formerly BellSouth Wireless Data), and Metricom, Inc. (“Metricom”). These three companies use 800 MHz, 900 MHz, and unlicensed and Wireless Communications Service (“WCS”) spectrum, respectively.³²¹

While this report discusses current mobile data offerings in four general categories, several providers and technologies bridge the various sectors. For example, Research in Motion Limited (“RIM”) manufactures and sells handheld PDA devices with built-in wireless modems that connect to the Internet over Motient’s and Cingular Interactive’s dedicated data networks.³²² RIM also offers a wireless e-mail access service called BlackBerry, which is co-branded and resold by several different mobile data companies. In addition, users of handheld PDAs made by Palm, Inc. (“Palm”) and Handspring, Inc. (“Handspring”) can access the Internet while mobile by attaching their devices to a mobile phone, thereby piggybacking on the mobile telephone’s Internet connection.

³¹⁷ Unless otherwise noted, throughout Section II.B “mobile Internet access” in relation to mobile telephone carriers refers to Internet access on mobile telephone handsets, not Internet access on a laptop computer connected to a mobile telephone.

³¹⁸ Unless otherwise noted, the terms “wireless web” and “mobile web” are used throughout Section II.B to mean mobile Internet access via mobile telephone handsets.

³¹⁹ SMS provides the ability to send and receive text messages to and from mobile handsets with message length ranging from 120 to 256 characters. *See* note 440, *infra*.

³²⁰ PDAs are handheld devices that include organizer software, such as an appointment calendar, directory, to-do list, and memo pad, and that can be connected to a user’s desktop computer to ensure that the data on both devices are synchronized. Many PDAs allow users to download additional software, and some PDAs allow users to attach external devices, such as a keyboard, digital camera, location device, mobile phone, or wireless modem. This report uses the terms “handheld,” “PDA,” “handheld device,” “handheld PDA,” and “PDA device” interchangeably and focuses on handheld PDAs with a wireless Internet connection.

³²¹ *See* Appendix A for a discussion of the use of unlicensed and WCS spectrum for fixed wireless services.

³²² *See* Section II.B.2.c(ii), RIM Devices and BlackBerry Service, *infra*.

In addition to discussing the four categories of current mobile data offerings mentioned above, the report examines certain developing mobile data services and technologies, including WAP, location-based services, m-commerce, and short-range data transmissions. These technologies and services are starting to become integrated into existing mobile data products and have the potential to influence greatly the evolution of the mobile data industry. The mobile data section concludes with a discussion of wireless telemetry services.

The mobile data industry has grown substantially since the writing of the *Fifth Report*. As of the summer of 2000, four leading mobile telephone carriers – Sprint PCS, AT&T Wireless, Verizon Wireless, and Nextel – had launched mobile Internet access products. By the end of 2000, these four carriers had nearly 2.5 million mobile data users combined.³²³ Three additional mobile telephone carriers, VoiceStream, ALLTEL, and Cingular Wireless, have also launched their own mobile Internet access services since the writing of the *Fifth Report*.³²⁴ During 2000, paging/messaging carriers also continued to market web-based products on advanced, two-way devices. PDA manufacturers began offering additional handheld devices with wireless Internet connectivity and expanded their Internet-based content and services. In addition, Metricom began offering Ricochet, its wireless Internet access service provided by modem devices attached to laptop computers, in 15 markets during 2000.³²⁵ Ricochet gives users Internet access speeds of up to 128 kbps in 13 of those 15 markets.³²⁶

b. International Developments

While mobile data products are gaining popularity in the United States, these types of products have even more users in other countries. For example, in Japan, 21.7 million people, or 15 percent of the population, subscribed to NTT DoCoMo's i-mode mobile Internet service at the end of March 2001.³²⁷ This

³²³ The count of mobile data users was calculated based on year-end company news releases, and estimates for companies that did not disclose year-end 2000 mobile data user numbers. Analysts have estimated the number of mobile data users to be in the range of 2 to 3 million users. The Yankee Group estimates there were more than 2 million wireless data users at the end of 2000. See Dan Meyer, *Speed Bumps Limits Of Wireless Web Stifle Early Growth*, RCR WIRELESS NEWS, Jan. 29, 2001, at 16. The Strategis Group estimated there were approximately 3 million cellular/PCS/ESMR mobile data subscribers in 2000. See THE STRATEGIS GROUP, *U.S. Mobile Data Marketplace: 2001* (2001), at 116 (“2001 Strategis Mobile Data Report”). Because some mobile telephone carriers offer mobile Internet access without a separate subscription beyond voice service, the term “users” is used instead of “subscribers.” Mobile telephone carriers generally define their mobile Internet “users” as customers who have connected to the Internet using their mobile handsets within a certain period of time.

³²⁴ See Section II.B.2.d(iii), Metricom, *infra*.

³²⁵ Ricochet wireless modems, as well as Ricochet monthly Internet service, are sold by Metricom. Metricom uses the 900 MHz and 2.4 GHz unlicensed bands, as well as WCS, for Ricochet. See Section II.B.2.d(iii), Metricom, *infra*.

³²⁶ Internet access speeds in the other markets are approximately 28.8 kbps. See Metricom, *Coverage Maps* (visited Feb. 19, 2001) <http://www.metricom.com/about_us/coverage_maps/index.html>; Section II.B.2.d(iii), Metricom, *infra*.

³²⁷ NTT DoCoMo, *Increase of Subscriber Number of i-mode* (visited May 15, 2001) <<http://www.nttdocomo.com/i/inumber.html>>.

represented 60 percent of DoCoMo's 36 million total mobile telephone subscribers³²⁸ and was a 245 percent increase from the 5.8 million i-mode subscribers in March 2000.³²⁹ In Europe, SMS has become increasingly popular. In December 2000, mobile telephone users in the United Kingdom sent 756 million SMS messages, almost triple the 271 million sent in December 1999.³³⁰ In Germany, 1.8 billion SMS messages were sent during December 2000, almost four times the 500 million sent during December 1999.³³¹ And in Finland, 90 percent of mobile telephone subscribers use SMS and send a total of over 75 million messages per month.³³²

c. 3G Developments

As explained above, Third Generation, or "3G," generally refers to high-speed advanced mobile services and the next generation of technologies – beyond the current 2G technologies of CDMA, TDMA, GSM, and iDEN – that will make such services possible. The *Fifth Report* discussed in depth the various 2.5G and 3G technology standards in development and which of these technologies mobile telephone carriers would likely use to migrate from their current 2G technologies in order to offer mobile data services at higher speeds.³³³ As explained above, the term 2.5G is used to describe the interim technologies that carriers will use while migrating from their current 2G technologies to 3G technologies.

Since the writing of the *Fifth Report*, several developments have occurred on the road to 3G. During 2000 and 2001, many mobile telephone operators in the United States made announcements regarding the deployment of 2.5G and 3G networks, conducted trials of 2.5G and 3G technologies, and signed contracts with equipment vendors.³³⁴ However, many analysts and industry players believe that the widespread deployment of 3G networks and other advanced wireless technologies is still several years away, given certain technological and economic obstacles yet to be overcome.³³⁵ As discussed below, some mobile

³²⁸ NTT DoCoMo, *NTT DoCoMo's Number of Subscribers as of March, 2001* (visited Apr. 30, 2001) <<http://www.nttdocomo.com/corporate/ir/index.html>>.

³²⁹ NTT DoCoMo, *Increase of Subscriber Number of i-mode* (visited Mar. 5, 2001) <<http://www.nttdocomo.com/i/inumber.html>>.

³³⁰ *3 Billion G-Mails in December '99 Short Messages Hit the Mark for Consumers*, News Release, GSM Association, Feb. 2, 2000; *More Than 200 Billion GSM Text Messages Forecast for Full Year 2001*, News Release, GSM Association, Feb. 12, 2001.

³³¹ *Id.*

³³² Steve Gold, *More Finns Swap Their Fixed Lines for Mobile Phones*, NEWSBYTES NEWS NETWORK, June 1, 2000, available in 2000 WL 21178000; Peter H. Lewis, *Norse Riders Of The Wireless Wave Scandinavians Lead The World In The "Mobile Lifestyle" Via Wireless Communications*, STAR-TRIBUNE (Minneapolis-St. Paul), July 24, 2000, available in 2000 WL 6981691.

³³³ *See Fifth Report*, at 17697-17703.

³³⁴ *See Appendix D, Tables 1 and 2, at D-2 – D-3*, for an overview of 2.5G and 3G contracts and trials in the United States.

³³⁵ Jerry Yang, CEO of Yahoo, Inc., stated in March 2001, "While it's hard to look out five years, wireless is still in need of innovation until the economy picks up again – the return on investment is needed.... The hockey stick curve representing a massive takeoff of wireless keeps getting pushed out two or three years. I think it will have really taken off when voice becomes a small part of what's being delivered." *See Patrick Mannion, Wireless*

carriers outside the United States have delayed the launch of their 2.5 and 3G networks – some of which were originally scheduled to occur during the first half of 2001 – due to various hardware and software problems.

In the United States, carriers have been given the flexibility to choose which technology to use to deploy voice, as well as advanced mobile data, services. The two largest mobile telephone carriers that currently use CDMA as their 2G technology, Verizon Wireless and Sprint PCS, announced in early 2001 that they plan to roll out cdma2000 1X as the first phase of their 3G technology rollout during 2001.³³⁶ Cdma2000 1X is expected to double voice capacity as compared with current CDMA networks and increase data transfer speeds to 144 kbps.³³⁷ Both carriers plan to deploy cdma2000 1xEV, Verizon Wireless in 2002 and Sprint PCS in 2003, which is expected to boost network data speeds to 2.4 Mbps.³³⁸ In addition, Nextel has announced that it plans to overlay cdma2000 technology on its existing iDEN network.³³⁹

The major GSM and TDMA carriers in the United States, AT&T Wireless, VoiceStream, and Cingular Wireless, are taking a different migration path to 3G technology. All three carriers plan to deploy GPRS³⁴⁰

2001 Keynotes Embrace Innovation, ELECTRONIC ENGINEERING TIMES, Mar. 26, 2001. In April 2001, Cahners In-Stat Group predicted that delays in handset introductions, lower than expected consumer demand, and high spectrum costs will delay 3G deployment, and stated, “Although the market may take off in several years, the short-term prospects for the technology that enables video calls, high-speed Internet access, multimedia services and other features are bleak.” See *In-Stat Predicts Bleak Short Term Prospects for Wireless 3G, Despite Heavy Technology Investment by Carriers*, BUSINESS WIRE, Apr. 24, 2001. Ben Thacker, an analyst with Visiongain, reported in April 2001 that many in the wireless industry do not expect to see 3G networks rolled out on a widespread basis until the second half of 2003, about one year later than many had previously expected. See Sylvia Dennis, *3G Plans Still Up In The Air – Report*, NEWSBYTES, Apr. 30, 2001. See also, *Obstacles on the Road to Wireless*, New Media Investor, Mar. 29, 2001; Reshma Kapadia, *Web Executives Play Down Wireless Internet Hype*, REUTERS, Mar. 16, 2001; Peter S. Goodman, *Where’s the Wireless Web?*, WASHINGTON POST, Mar. 30, 2001, at E-1. See note 340, *infra*, for a discussion of GPRS handset problems.

³³⁶ *Sprint Leads Evolution to 3G with Nation’s Clearest, Fastest, Most Economical Migration Strategy*, News Release, Sprint PCS, Mar. 20, 2001; *Verizon Wireless and Lucent Technologies Plan to Speed Introduction of Third-Generation (3G) Technologies to U.S.*, News Release, Verizon Wireless, Mar. 19, 2001; *2001 Strategis Mobile Data Report*, at 57-58.

³³⁷ *2001 Strategis Mobile Data Report*, at 57.

³³⁸ *Id.*, at 57-58; *Verizon Wireless and Lucent Technologies Plan to Speed Introduction of Third-Generation (3G) Technologies to U.S.*, News Release, Verizon Wireless, Mar. 19, 2001.

³³⁹ Nextel Communications, Inc., SEC Form 10-K, Apr. 2, 2001, at 12; Sam Omatseye, *Technology Wars Set to Play Out in Japan, U.S.*, RCR WIRELESS NEWS, Apr. 23, 2001, at 8; Marisa Torrieri, *Nextel’s Numbers Still Low, But Promise High*, WIRELESS DATA NEWS, Mar. 28, 2001.

³⁴⁰ GPRS is a packet-based data-only network upgrade that allows for faster data rates by aggregating up to eight 14.4 kbps channels. See *Fifth Report*, at 17700. This channel aggregation reportedly caused unacceptable heating and battery drain problems in the initial GPRS handset models. Accordingly, handset manufacturers have been forced to limit the amount of channel aggregation, which has therefore limited GPRS data speeds to 20-30 kbps. See Peggy Albright, *Will GPRS Comply with SAR Standards?*, WIRELESS WEEK, Apr. 30, 2001; Paul Durman, *Technical Bugs Plague Phones*, SUNDAY TIMES (LONDON), Mar. 4, 2001. However, recent technological developments may begin to address these GPRS handset problems. See *Tropian to Discuss Breakthrough RF Solution for High-Speed Wireless Data at GPRS Conference in Rome; Company’s Breakthrough Products Support 1G to 3G in a Single Chipset*, BUSINESS WIRE, May 11, 2001.

technology during 2001,³⁴¹ which is expected to raise data transfer speeds to between 25 and 144 kbps.³⁴² AT&T Wireless, which currently uses TDMA as its 2G technology, announced in November 2000 that it will begin deploying a GSM and GPRS overlay on its existing TDMA network during 2001.³⁴³ After rolling out GPRS, these three carriers are expected to eventually migrate to and possibly deploy EDGE as an intermediate technology between GPRS and WCDMA.³⁴⁴ EDGE is expected to raise network speeds to 384 kbps, WCDMA to 2 Mbps.³⁴⁵ Cingular Wireless is reportedly planning to build out EDGE to all of its markets during 2002 and 2003.³⁴⁶ AT&T Wireless has announced that it expects to migrate to EDGE during 2002 and to WCDMA beginning in 2003.³⁴⁷ In addition, in conjunction with the substantial investment it received from NTT DoCoMo, AT&T Wireless has announced it will begin offering i-mode in early 2002, initially in Seattle and eventually to the rest of the country over one to two years.³⁴⁸

While U.S. carriers are allowed to upgrade their existing networks and use their existing spectrum to offer

³⁴¹ Cingular Wireless has announced it will offer GPRS in the areas currently served by its GSM networks. *Cingular Wireless First to Usher in Next Generation of Wireless Internet with Faster, Always-on Service*, News Release, Cingular Wireless, Mar. 20, 2001; *2001 Strategis Mobile Data Report*, at 58-59. *Samsung Telecommunications America and VoiceStream Wireless to Develop GPRS Mobile Phones Standardized on the Microsoft Mobile Explorer and "Stinger" Smart Phone Platforms*, News Release, VoiceStream, Nov. 6, 2000.

³⁴² Predictions about GPRS speeds vary. See Peggy Albright, *Roll Out The GPRS Handsets*, WIRELESS WEEK, Feb. 19, 2001, at 19 ("Most [GPRS networks] will operate at around 20 to 30 kbps on the downlink"); Grahame Lynch, *Dropping EDGE could regain edge for AT&T*, AMERICA'S NETWORK, Feb. 1, 2001, at 20 (The GPRS "platform currently supports real-world speeds of between 25 kbps and 50 kbps at the cell."). Several sources estimate maximum GPRS speeds will be 115 kbps. See Harry Newton, *Newton's Telecom Dictionary: 16th Expanded & Updated Edition*, CMP Books, July 2000, at 397; Grahame Lynch and Fiona Chau, *Surprise Twists In CDMA's Future*, AMERICA'S NETWORK, Nov. 15, 2000, at 30; Bambi Francisco, *The 'Wireless Web' Die Is Cast*, CBS.MARKETWATCH.COM, Dec. 31, 2000; GSM World, *GSM – Glossary of Terms* (visited Feb. 26, 2001) <<http://www.gsmworld.com/technology/glossary.html>>. However, at least one source reports AT&T Wireless's GPRS network will reach speeds of 144 kbps. See Denise Pappalardo, *AT&T Wireless Maps Major 3G Plan*, NETWORK WORLD, Dec. 11, 2000, at 41.

³⁴³ See AT&T Corp., SEC Form 10-K405/A, Apr. 17, 2001 ("AT&T Wireless Group recently announced plans to deploy a GSM platform for interim improvements in wireless data capabilities on the evolutionary path to third generation services, as well as associated voice services. This platform will be deployed as an overlay on AT&T Wireless Group's second generation voice network. GSM platform deployment is planned to begin in the second half of 2001.").

³⁴⁴ Denise Pappalardo, *AT&T Wireless Maps Major 3G Plan*, NETWORK WORLD, Dec. 11, 2000, at 41; *Cingular's GSM Flirtation May Stem From AT&T Actions*, TELE.COM, Feb. 5, 2001, available in 2001 WL 8103883; Nikki Swartz, *The Cingular Sensation*, Wireless Review, Jan. 1, 2001, available in 2001 WL 6905154; *2001 Strategis Mobile Data Report*, at 56-59.

³⁴⁵ *2001 Strategis Mobile Data Report*, at 56-59.

³⁴⁶ *Id.*, at 58-59; Nikki Swartz, *The Cingular Sensation*, WIRELESS REVIEW, Jan. 1, 2001, available in 2001 WL 6905154.

³⁴⁷ See AT&T Corp., SEC Form 10-K405/A, Apr. 17, 2001; *Telephony*, COMMUNICATIONS DAILY, June 5, 2001.

³⁴⁸ *NTT DoCoMo, AT&T Wireless To Offer Wireless Web Svc in US*, DOW JONES INTERNATIONAL NEWS, Mar. 14, 2001.

advanced mobile services, many claim they need additional spectrum in order to offer mobile Internet access at higher, 3G-level speeds. The Commission is responding to this increased demand for spectrum by trying to identify spectrum to license for advanced mobile services, including 3G. In January 2001, the Commission released a Notice of Proposed Rulemaking exploring the possibilities of using five different spectrum bands for advanced mobile services: 1710-1755 MHz, 1755-1850 MHz, 2110-2155 MHz, 2160-2165 MHz, and 2500-2690 MHz.³⁴⁹ Two of these bands, 1710-1755 MHz and 2110-2150 MHz, are subject to a statutory auction deadline of September 2002.³⁵⁰

The 1710-1850 MHz and 2500-2690 MHz bands are two of the three bands that members of the 2000 World Radiocommunication Conference (“WRC-2000”) identified for possible implementation of 3G services.³⁵¹ In the United States, the 1710-1850 MHz band is currently used by the Department of Defense for military purposes,³⁵² and the 2500-2690 MHz band is used by Multipoint Distribution Service (“MDS”) and Instructional Television Fixed Service (“ITFS”) operators to offer fixed wireless educational and commercial video services, as well as high-speed Internet access to homes and small businesses on a limited, but growing, basis.³⁵³ In March 2001, the Commission and the National Telecommunications and Information Administration (“NTIA”) released final studies of how both of these bands are currently used and their potential for accommodating advanced mobile services.³⁵⁴

In addition, the Commission is scheduled to begin auctioning licenses for 30 megahertz of spectrum in the

³⁴⁹ Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, *Notice of Proposed Rulemaking and Order*, ET Docket No. 00-258 (rel. Jan. 5, 2001) (“*Advanced Wireless NPRM & Order*”).

³⁵⁰ Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 §§ 3002(b), 3002(c) (1997). The 1710-1755 MHz band will be transferred from the Department of Defense to the Commission pursuant to statutory requirements. However, federal government use of the band can continue within 16 protected areas. See Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium, FCC 99-354, *Policy Statement*, 14 FCC Rcd 19868 (1999) (“*1999 Policy Statement*”); *Advanced Wireless NPRM & Order*. In 1999, the Commission proposed allocating the 2110-2150 MHz band for advanced fixed and mobile services, of which one possible use would be 3G mobile systems. See *1999 Policy Statement*.

³⁵¹ The third band was 806-960 MHz. *Provisional Final Acts of World Radio Conference (Istanbul-WRC-2000)*.

³⁵² Department of Commerce, The Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts, *Final Report*, March 2001, at xiv.

³⁵³ Federal Communications Commission, Spectrum Study of the 2500-2690 MHz Band, The Potential for Accommodating Third Generation Mobile Systems, *Final Report*, Mar. 30, 2001. See Appendix A, *infra*, for a discussion of fixed wireless Internet offerings by MDS operators.

³⁵⁴ Federal Communications Commission, Spectrum Study of the 2500-2690 MHz Band, The Potential for Accommodating Third Generation Mobile Systems, *Final Report*, Mar. 30, 2001; Department of Commerce, The Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts, *Final Report*, March 2001.

upper 700 MHz band on September 12, 2001.³⁵⁵ This spectrum is part of a larger band, 698-806 MHz, that the WRC-2000 identified for possible implementation of 3G systems.³⁵⁶ Mobile operators could use the spectrum in the upper 700 MHz band to offer high-speed mobile Internet access once it is licensed.³⁵⁷

European and Asian countries continued to license spectrum for 3G services during 2000.³⁵⁸ At the writing of the *Fifth Report*, the United Kingdom had completed its 3G auction, and Finland and Spain had awarded 3G licenses through “beauty contests.”³⁵⁹ Since that time, Germany, Austria, Belgium, Italy, the Netherlands, and Switzerland have completed 3G spectrum auctions, while Japan, Norway, Portugal, Sweden, and South Korea have awarded 3G licenses using beauty contests. Unlike the United States, European and other countries have made 3G spectrum available only for the deployment specific technologies, in this case GPRS and WCDMA. Therefore, carriers in those countries are not allowed to deploy 3G technologies in the same spectrum bands as their current 2G networks but must use separate bands for the different technologies.

Like the U.S. carriers discussed above, mobile carriers abroad have announced plans to roll out commercial 3G services over the next several years, although many delayed their initial launch dates during early 2001.³⁶⁰ In Japan, for example, NTT DoCoMo had positioned itself to be the first carrier to introduce 3G mobile services with a rollout date of May 2001. However, in April 2001, the company announced it would delay its 3G launch to October 2001 due to technological problems.³⁶¹ In May 2001, BT delayed the

³⁵⁵ One 10-megahertz license and one 20-megahertz license will be offered in each of the six Economic Area Groups (“EAGs”) that cover the United States. See Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission’s Rules, WT Docket No. 99-168, *First Report and Order*, 15 FCC Rcd 476 (2000).

³⁵⁶ See *Advanced Wireless NPRM & Order*, ¶ 4 and note 12; *Provisional Final Acts of World Radiocommunication Conference (Istanbul-WRC-2000)*, Resolution 223.

³⁵⁷ This spectrum is currently encumbered by television broadcasters in channels 60-69 who are permitted by statute to continue operations until December 31, 2006, at which time their markets are to be converted to digital television (“DTV”). See 47 U.S.C. § 337(e); 47 U.S.C. § 309(j)(14). However, incumbent broadcasters may extend their operations beyond this date if certain DTV service penetration targets are not met. One of these targets is that 85 percent of the household in a given television market must have a digital TV receiver or digital TV converter technology. See 47 U.S.C. § 309(j)(14). See also Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission’s Rules, WT Docket No. 99-168, *First Report and Order*, 15 FCC Rcd 476 (2000); Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), *Notice of Proposed Rule Making*, GN Docket No. 01-74, FCC 01-91, ¶¶20-26 (rel. Mar. 28, 2001).

³⁵⁸ See Section II.A.3, International Developments, *supra*. See Appendix D, Table 3, at D-4 for an overview of 3G licensing abroad.

³⁵⁹ In a “beauty contest,” also called a comparative tender, applicants and their bids are judged by government agencies based on criteria set out beforehand, such as their financial resources, their commitment to meet specified investment and build-out targets, and their ability to promote certain objectives such as the rapid introduction of service, wide geographic coverage, reasonable prices, quality and reliability.

³⁶⁰ Akiko Kashiwagi and Clay Chandler, *Next-Generation Wireless on Hold; Japanese Phone Giant’s 4-Month Postponement Follows Delays in Europe, U.S.*, THE WASHINGTON POST, Apr. 25, 2001, at E-3; NCC Warns of 3G Delays, GLOBAL NEWS WIRE, Apr. 25, 2001.

³⁶¹ Yuri Kageyama, *NTT DoCoMo Delays Rollout of Next-Generation Wireless Service*, THE ASSOCIATED PRESS, Apr. 24, 2001; Yuri Kageyama, *NTT DoCoMo Explains Decision on Limited 3G Rollout*, THE ASSOCIATED

launch of 3G services on the Isle of Man from the end of May 2001 until at least September 2001 due to software problems with handsets.³⁶²

2. Current Offerings

a. Paging/Messaging

Since the writing of the *Fifth Report*, paging/messaging carriers have continued to position themselves as major players in the mobile data sector.³⁶³ By mid-year 2000, several carriers were offering advanced messaging services over their own networks.³⁶⁴ These services include e-mail, Internet-based offerings, personalized web content, two-way messaging and 1.5 way guaranteed messaging.³⁶⁵ Advanced messaging services allow carriers to generate higher revenues per user than traditional one-way paging services.³⁶⁶ As a result, carriers can remain profitable with fewer subscribers. Analysts believe that traditional paging companies that are innovative and develop services beyond one-way paging and messaging will be the most successful.³⁶⁷ As discussed below, during 2000, many paging/messaging carriers continued to form strategic partnerships with content providers and software developers in order to expand their Internet offerings.

(i) Industry Structure and Performance

Subscribership and revenues in the paging/messaging industry declined during 2000.³⁶⁸ According to one analyst, the total number of paging/messaging subscribers fell 1 percent from 45.8 million in 1999 to 45.3 million in 2000.³⁶⁹ In addition, revenues in the paging/messaging sector decreased from \$5.25 billion in

PRESS, Apr. 26, 2001. At that time, NTT DoCoMo stated it would run a trial of its 3G technology with 5,000 customers in Tokyo between May and October, 2001. Akiko Kashiwagi and Clay Chandler, *Next-Generation Wireless on Hold; Japanese Phone Giant's 4-Month Postponement Follows Delays in Europe, U.S.*, THE WASHINGTON POST, Apr. 25, 2001, at E-3. In May 2001, NTT DoCoMo stated it would not be able to offer 3G mobile phone service throughout all of Japan until at least 2004. *New Mobile Phones Delayed in Japan*, THE ASSOCIATED PRESS, May 22, 2001.

³⁶² Richard Baum, *BT Delays First 3G Launch As Mobiles Fail*, REUTERS, May 14, 2001. The software problem reportedly prevents the network from seamlessly passing the call to a radio in the next cell. *Id.*

³⁶³ Cynthia M. Motz, CFA, *Hey Babe, Take a Walk on the Wireless Side*, U.S. Wireless Telecommunications Services, Credit Suisse First Boston, May 5, 2000, at 12.

³⁶⁴ See Appendix D, Table 8, at D-10.

³⁶⁵ See *Fifth Report*, at 17717.

³⁶⁶ Jennifer Mears, *Paging Carriers Learn to Fly; One-way Providers Metamorphose into Two-way Messaging*, WIRELESS WEEK, Aug. 28, 2000.

³⁶⁷ Marisa Torrieri, *Company Woes Prove Messaging's Not the Savior*, WIRELESS DATA NEWS, Jan. 31, 2000 (citing Rob Hegblom from the Strategis Group).

³⁶⁸ See Appendix D, Tables 5-7, at D-7 – D-9.

³⁶⁹ *U.S. Paging Subscribers and Revenues*, PCIA Global Wireless Portfolio, at 10, 2000 Edition (citing the Strategis Group). The number of one-way subscribers fell 2.2 percent from 45.1 million in 1999 to 44.1 million in 2000. *Id.*

1999 to \$5.1 billion during 2000.³⁷⁰ However, during 2000, the number of advanced messaging subscribers increased over 70 percent from 700,000 to 1.2 million subscribers, and revenues attributed to advanced messaging were \$257 million at year end 2000, a 46 percent increase over 1999's advanced messaging revenues of \$176 million.³⁷¹

Arch and Metrocall, Inc. ("Metrocall") are the largest carriers in the paging/messaging sector,³⁷² together accounting for approximately 45 percent of the subscribers in the paging/messaging sector.³⁷³ Other major carriers include SkyTel Communications, Inc. ("SkyTel"),³⁷⁴ WebLink Wireless, Inc. ("WebLink"), and Verizon Wireless Messaging Services, Inc. ("Verizon Messaging").³⁷⁵ Cingular Interactive and Motient also provide advanced messaging services,³⁷⁶ and are discussed in more detail in the Dedicated Data Network section of this report.

Among other satellite companies, Orbcomm and Motient offer satellite messaging, paging, e-mail and other data services. Orbcomm provides two-way monitoring, tracking and satellite messaging service using low-earth orbiting satellites. In February 2001 Orbcomm sent over 872,000 messages.³⁷⁷

During 2000, carriers also made efforts to expand their subscriber base with new market offerings.³⁷⁸ For example the CampusLink program initiated by Metrocall encourages the use of advanced messaging services among college students. CampusLink allows university departments to use wireless devices to inform students of upcoming events such as orientation, class scheduling changes and other helpful campus-oriented events.³⁷⁹

³⁷⁰ *Id.*

³⁷¹ *Id.*

³⁷² *Top Paging Carriers*, RCR RADIO COMMUNICATIONS REPORT, July 11, 2000.

³⁷³ Figure based on Third Quarter 2000 results. See Appendix D, Table 6, at D-8.

³⁷⁴ SkyTel Communications, Inc. is a wholly owned subsidiary of WorldCom that was acquired on October 1, 1999. See *Fifth Report*, at 17720-17721.

³⁷⁵ GTE's remaining paging operations and AirTouch Communications's paging operations are now combined as Verizon Wireless Interactive Messaging Services, Inc. See Verizon Wireless Messaging Services, *Company Information* (visited Apr. 27, 2001) <<http://www.airtouchpaging.com/index.asp>>.

³⁷⁶ See Section II.B.2.d, Dedicated Data Networks, *infra*.

³⁷⁷ *Hotbird*, C. E. Unterberg, Towbin, Mar. 12, 2001, at 43.

³⁷⁸ *Metrocall Launches 'CampusLink' Marketing Campaign Targeting Class of '04; Wireless Leader Will Commence Aggressive Marketing Initiative at Schools from Coast to Coast*, News Release, Metrocall, Apr. 20, 2000.

³⁷⁹ CampusLink has been implemented at Loyola-Marymount University in Louisiana and the Colorado School of Mines. Metrocall conducted a trial of CampusLink with alphanumeric pagers at Loyola-Marymount University with 1,000 students, many of whom opted to retain services after the free trial period expired. *Metrocall Launches 'CampusLink' Marketing Campaign Targeting Class of '04; Wireless Leader Will Commence Aggressive Marketing Initiative at Schools from Coast to Coast*, News Release, Metrocall, Apr. 20, 2000. Metrocall has agreements with several other colleges to participate in CampusLink during the summer and fall of 2001. Conversation with Michael T. Scanlon, Metrocall, Mar. 27, 2001.

(a) Mergers, Acquisitions, and Restructurings

Arch Communications and Paging Network, Inc. ("PageNet"), completed their merger on November 10, 2000.³⁸⁰ In addition to the Arch-PageNet merger, there were several other small mergers of regional carriers.³⁸¹

Since January 1, 2000, other developments in the paging/messaging industry include three of the top five paging companies filing for bankruptcy.³⁸² These three companies are TSR Wireless, Inc. ("TSR Wireless"), Metrocall, and WebLink. TSR Wireless, the largest privately held paging company with 2.5 million subscribers, filed for Chapter 7 bankruptcy on December 4, 2000.³⁸³ On March 28, 2001, the U.S. Bankruptcy Court approved the Asset Purchase Agreements of TSR Wireless's licenses by Space Data Research, LLC ("Space Data"), SkyTel, and Network Services, LLC.³⁸⁴ Prior to filing for bankruptcy,

³⁸⁰ Arch Wireless Completes Merger with PageNet, Becomes Leading Provider of Two-way Internet Messaging, News Release, Arch, Nov. 20, 2000; see *Fifth Report*, at 17720-17721, for details of the merger.

³⁸¹ Aquis Communications, Inc. ("Aquis") acquired several small, regional paging companies. Aquis increased its subscriber base through the strategic regional acquisitions of Suburban Connect and SourceOne Paging. SourceOne Paging operated in several major Midwestern cities including: Chicago, Minneapolis, and Detroit. Aquis had been managing the operations of SourceOne since August 1999. *Aquis Communications Acquires Suburban Paging*, News Release, Aquis, June 16, 2000. Suburban Connect, a metropolitan Philadelphia paging company, had 19,000 subscribers. *Aquis Completes SourceOne Wireless Acquisitions*, News Release, Aquis, Feb. 1, 2000. Teletouch Communications, Inc. ("Teletouch"), a regional paging/messaging carrier that focuses on smaller metropolitan markets in the south, acquired GTE's Texarkana paging operations when GTE sold several of its paging operations following the merger that created Verizon Wireless. The acquisition provided immediate positive cash flow for Teletouch. *Teletouch Communications Acquires Texarkana Paging Operations and Paging Frequency*, BUSINESS WIRE, Sept. 27, 2000.

³⁸² *Top Paging Carriers*, RCR, July 11, 2000.

³⁸³ Chapter 7 bankruptcy requires liquidation of assets. Yuki Noguchi, *Pager Firm is Latest to Pull the Plug; Failure of TSR Wireless Shows Industry Woes*, THE WASHINGTON POST, Dec. 7, 2000, available in 2000 WL 29920221. TSR wireless had been operating a 30-state network. The company has over \$200 million in debt outstanding to creditors. J.B. Houck, *TSR Wireless Still Paging, for Now*, WIRELESS NEWSFACTOR, Dec. 15, 2000. Its assets include its network, subscriber base, 275 retail outlets, numerous one-way licenses, one national narrowband PCS license, five regional narrowband PCS licenses, and 2,000 antennas. Mike Dano, *Questions Linger About TSR Demise*, GLOBAL WIRELESS, Jan. 1, 2001.

³⁸⁴ Mike Dano, *Three Companies Pay \$12.2M for TSR Assets*, RCR WIRELESS NEWS, Apr. 2, 2001, available in 2001 WL 8869219. Space Data has agreed to purchase TSR Wireless's national narrowband PCS license for \$2.6 million, and SkyTel has agreed to purchase its five regional narrowband PCS licenses for \$3.6 million. *Id.* Network Services, LLC has agreed to purchase all of TSR Wireless's one-way paging assets for \$6 million. *Bankruptcy Court Approves TSR Wireless Asset Purchase Agreement by Network Services, LLC.*, News Release, Network Services, LLC, Mar. 28, 2001. The applications for the Commission's consent to transfer control of the narrowband PCS licenses to Space Data and SkyTel are currently pending. See ULS File No. 0000423487, received Apr. 10, 2001; ULS File No. 0000417882, received Apr. 24, 2001. Space Data is planning to use the narrowband PCS license to operate a free-floating, balloon-borne communications system to provide two-way paging – a type of operation not specifically mentioned in the narrowband PCS rules. Therefore, Space Data filed with its application a Request for Declaratory Ruling or, in the alternative, for Waiver regarding the Commission's rules. On Apr. 19, 2001, the Commission released a Public Notice seeking comment on Space Data's request. See Wireless Telecommunications Bureau Seeks Comment on Space Data Research, LLC's Request for Declaratory Rule or Waiver Regarding the Narrowband PCS Rules, *Public Notice*, DA 01-970, rel. Apr. 19, 2001.

TSR Wireless had been activating 35,000 new subscribers a month.³⁸⁵

On April 2, 2001, Metrocall and WebLink announced that the two companies would merge through concurrent future Chapter 11 bankruptcy proceedings.³⁸⁶ However, on May 16, 2001 the two companies announced that they were abandoning this plan, and on May 24, 2001 WebLink announced that it was filing for Chapter 11 bankruptcy.³⁸⁷

In addition, in September 2000 Orbcomm filed for bankruptcy under Chapter 11, but continued to provide service.³⁸⁸ In April 2001 Orbcomm was purchased by International Licensees, LLC.³⁸⁹

In previous CMRS Competition Reports, the Commission concluded that the paging industry was highly competitive.³⁹⁰ Notwithstanding the merger activity of the past year, the Commission has a number of reasons to believe that the level of competition in this industry segment remains consistent with previous years. First, there is still an average of 28 paging licensees serving each of the 25 largest cities in the United States (not including resellers) and an average of 10 paging licensees serving each of the 25 smallest MSAs.³⁹¹ Second, the costs of switching carriers for consumers remain relatively low. Third paging carriers are facing strong competition from other sectors of the wireless industry.

(ii) Advanced Internet-Based Offerings

In addition to traditional one-way messaging, paging/messaging carriers are offering advanced messaging services,³⁹² including e-mail, organizer applications and Internet content, in response to increasing customer demand for advanced mobile data services.³⁹³ As evidence of this increased demand, during 2000, 300,000 one-way paging subscribers migrated to advanced messaging services.³⁹⁴ Because of the increased revenue potential, some carriers are attempting to identify efficient ways to speed the migration from one-way messaging to advanced messaging. For example, Arch launched a customer database management program that enables the company to identify and market advanced messaging services to its one-way

³⁸⁵ Mike Dano, *Questions Linger About TSR Demise*, GLOBAL WIRELESS, Jan. 1, 2001.

³⁸⁶ *WebLink and Metrocall to Merger in Chapter 11 Deal*, News Release, WebLink, Apr. 2, 2001.

³⁸⁷ WebLink intends to restructure its debt by converting high-yield notes worth \$470 million into equity. *WebLink Wireless, Inc. Announces Chapter 11 Filing; Intent to Convert All High-Yield Debt to Equity*, WebLink, News Release, May 24, 2001.

³⁸⁸ *Hotbird*, C.E. Unterberg, Towbin, Mar. 12, 2001, at 43.

³⁸⁹ Orbcomm (visited May 25, 2001) <<http://www.orbcomm.com>>.

³⁹⁰ *See Fifth Report*, at 17721-17722.

³⁹¹ RCR Publications, RCR'S 1999 PAGING DATABASE, 1999.

³⁹² *See Appendix D, Table 8*, at D-10.

³⁹³ WebLink Wireless, Inc., SEC Form 10-Q, Nov. 14, 2000, at 4.

³⁹⁴ *U.S. Paging Subscribers and Revenues*, PCIA Global Wireless Portfolio, at 10, 2000 Edition (citing the Strategis Group).

paging users.³⁹⁵

(a) Types of services and content

Studies indicate that subscribers view e-mail access as one of the most important features of advanced messaging devices.³⁹⁶ According to the Strategis Group, more than 30 million e-mail users said that e-mail is the most important offering for wireless data service.³⁹⁷ Most of the major paging/messaging carriers allow users to send, as well as receive, e-mail messages with two-way devices. Some carriers offer the ability to converge e-mail from several different e-mail accounts into a single account. For example, Arch provides the Arch Message Center Service which allows users to access consolidated e-mail, address books, and schedules from any web-connected desktop or through an Arch advanced messaging device.³⁹⁸ Arch's service is nationwide, includes Internet content at no additional charge and is priced at \$14.95 to send or receive 25,000 characters.³⁹⁹ Other carriers allow customers to filter their e-mail, read headers, or read the entire message and attachments.⁴⁰⁰ Many of the advanced messaging devices also provide additional organizational features that create a hybrid two-way pager/PDA.⁴⁰¹

Paging/messaging companies also offer customers the ability to receive personalized Internet content through their advanced messaging devices.⁴⁰² Users can register via the Internet with services that allow them to receive specific types of Internet content including sports scores, weather, stock quotes, driving directions, movie schedules, restaurant listings, and travel information.⁴⁰³

The various advanced messaging product offerings have created tiering in the market that allows for both

³⁹⁵ Arch Launches Customer Database Management Program to Better Identify and Target Two-Way Messaging Users, Arch, News Release, Feb. 19, 2001.

³⁹⁶ Marisa Torrieri, *Trends and Analysis from the Mobile Messaging and Internet Applications Conference*, WIRELESS DATA NEWS, Aug. 2, 2000, available in 2000 WL 7382594.

³⁹⁷ *Id.*

³⁹⁸ New Arch Wireless Service Enables Access to Home and Office E-mail Anytime, Anywhere, News Release, Arch, Oct. 25, 2000.

³⁹⁹ Users can also send e-mails from their advanced messaging devices. Arch, *Product Information* (visited Feb. 21, 2001) <<http://store.arch.com/Forms/Pager.cfm?agentid=arch&cfid=378974&cftoken=1609540&PagerType=webster>>.

⁴⁰⁰ WebLink Wireless Offers Wireless Access to Personal E-mail, News Release, WebLink, Jan. 5, 2001.

⁴⁰¹ See Section II.B.2.c, Handheld Devices, *infra*.

⁴⁰² SkyTel, *Strategy.com to Provide Personalized Financial News to Wireless Customers*, News Release, SkyTel, Nov. 9, 2000; Arch Partners with GoAmerica to Offer Wireless Internet for Mobile Data Market, News Release, Arch, Apr. 12, 2000; Metrocall, *Lifeminders Partner to Wirelessly Deliver Personalized Information and Reminder Messages to Customers*, News Release, Metrocall, June 28, 2000.

⁴⁰³ Subscribers to the Internet content services offered by paging/messaging carriers do not have access to the same type of content available with wireline web access, but only to content that has been specially-designed for these services.

lower-priced limited-service products and higher-priced, feature-rich products.⁴⁰⁴ For example, SkyTel offers SkyWord, a lower-tiered messaging product that offers the ability to receive text messages and limited access to news updates. SkyTel also offers SkyWriter, a higher-tiered product that offers guaranteed two-way messaging with the ability to send messages up to 500 characters in length to any e-mail address, other SkyTel pager or telephone, and unlimited access to customized Internet content.⁴⁰⁵

(b) Partnerships

During 2000, paging/messaging companies continued to form partnerships and joint ventures that allow subscribers to use enhanced applications, such as Internet and e-mail access.⁴⁰⁶ For example, Microsoft Corporation (“Microsoft”) offers WebLink’s two-way subscribers Internet content via the MSN Network,⁴⁰⁷ and OracleMobile, Inc. has executed agreements with several mobile data carriers to provide access to Internet content via advanced messaging devices. GoAmerica Communications, Corp. (“GoAmerica”) provides personalized content to Arch subscribers via its Go.Web Internet service,⁴⁰⁸ and Lifeminders, Inc. provides Internet content and custom reminder messages to Metrocall’s subscribers.⁴⁰⁹

In addition, advanced paging/messaging providers have co-branded wireless messaging devices with companies that include: traditional paging carriers,⁴¹⁰ Internet sites,⁴¹¹ Internet service providers,⁴¹² resellers,⁴¹³ equipment manufacturers⁴¹⁴ and Internet portals.⁴¹⁵ These co-branded products include the

⁴⁰⁴ Monica Rogers, *Paging Industry Battling to Adapt; More Functions, Wide Service Area are Selling Points*, CRAIN’S CHICAGO BUSINESS, July 24, 2000.

⁴⁰⁵ SkyTel, *Product Information* (visited Mar. 30, 2001) <<http://www.skytel.com>>.

⁴⁰⁶ *WebLink Wireless Signs Contracts with Notify Technology Corporation to Provide Wireless Access to Personal and Business E-mail*, News Release, WebLink, Dec. 7, 2000; *Verizon Wireless Messaging Services Selects Critical Path to Provide Wireless Messaging Infrastructure for Millions of Paging Customers*, News Release, Verizon Messaging, Nov. 6, 2000; *WebLink Wireless Teams with Cross Communications, RPA Wireless, and Veriprise Wireless*, News Release, WebLink, Sept. 26, 2000.

⁴⁰⁷ *WebLink Wireless Signs Strategic Alliance with Teletouch Communications to Provide Wireless Data Services*, News Release, WebLink, Mar. 15, 2000.

⁴⁰⁸ *Arch Partners with GoAmerica to Offer Wireless Internet for Mobile Data Market*, News Release, Arch, Apr. 12, 2000.

⁴⁰⁹ *Metrocall, Lifeminders Partner to Wirelessly Deliver Personalized Information and Reminder Messages to Customers*, News Release, Metrocall, June 28, 2000.

⁴¹⁰ *WebLink Wireless Signs Strategic Alliance with Teletouch Communications to Provide Wireless Data Services*, News Release, WebLink, Mar. 15, 2000; *WebLink Wireless Signs Seven Additional Wireless Data Carrier Contracts; Relationships Reinforce WebLink Wireless’ Position as the Industry’s Carriers’ Carrier*, News Release, WebLink, Feb. 24, 2000; *Aquis Signs Strategic Agreement with WebLink Wireless to Provide Two-Way Wireless Data Services*, News Release, Aquis, May 1, 2000.

⁴¹¹ *Arch, Weather.com Launch the Weather Channel Pager, Wireless Service offers Customized Weather Updates and Forecasts*, News Release, Arch, June 21, 2000.

⁴¹² *America Online and Arch Communications Plan to Deliver Wireless AOL Applications for ‘AOL Mobile Messenger,’* News Release, Arch, Feb. 28, 2000.

⁴¹³ *Excel Launches 2-way Messaging Through WebLink Wireless*, News Release, WebLink, Nov. 1, 2000.

names of both companies on the product itself. For example, Arch has teamed with America Online, Inc. (“AOL”) to provide two-way wireless messaging capabilities for the AOL Mobile Messenger Service. The service will also offer AOL’s instant messenger and e-mail service.⁴¹⁶

b. Mobile Telephone Operator Offerings

The major mobile telephone carriers continued to develop mobile data capabilities throughout 2000. Consumers are offered web access, SMS, and e-mail on their mobile phones. Each type of offering is discussed below.

(i) Wireless Web

Using their existing networks, seven providers⁴¹⁷ currently offer text-based wireless web⁴¹⁸ services via mobile telephone handsets at speeds ranging from 9.6 to 19.2 kbps.⁴¹⁹ During 2000, providers introduced new web-enabled phones and offered promotions throughout the year to encourage customers to use wireless web services. Mobile telephone providers continue to expand their wireless web networks and service capabilities and to migrate their networks to higher speed technologies during 2001.

The wireless web services currently offered by mobile telephone carriers enable customers to surf web sites for news, stock quotes, traffic reports, weather forecasts, movie listings, shopping, and other text-based information. Some mobile Internet users can also transact business, such as trading stocks or buying movie tickets, using their mobile phone. Wireless web customers have access to different content than is available with wireline web access, due to the fact that many content providers have redesigned their sites for wireless use.⁴²⁰ Sites that have not been redesigned for wireless use may be difficult to download on mobile devices or may present only limited text-based information. The specific web content available to wireless

⁴¹⁴ *Staying in Touch Gets Easier with BlackBerry by SkyTel*, News Release, SkyTel, May 31, 2000.

⁴¹⁵ *Yahoo! and WebLink Wireless Team to Bring Web Services to 2-Way Messaging Devices*, News Release, WebLink, Oct. 16, 2000.

⁴¹⁶ *America Online and Arch Communications Plan to Deliver Wireless AOL Applications for “AOL Mobile Messenger,”* News Release, Arch, Feb. 28, 2000.

⁴¹⁷ The seven wireless carriers offering wireless web service are ALLTEL, AT&T Wireless, Cingular Wireless, Nextel, Sprint PCS, Verizon Wireless, and VoiceStream.

⁴¹⁸ As mentioned above in note 318, *supra*, the terms “wireless web” and “mobile web” are used throughout Section II.B to mean mobile Internet access via mobile telephone handsets.

⁴¹⁹ The technologies and speeds used for wireless web services vary by mobile telephone carrier. Sprint PCS and Verizon Wireless currently have a maximum network speeds of 14.4 kbps. AT&T Wireless uses its Cellular Digital Packet Data (“CDPD”) network for its wireless web service and transfers data at rates of up to 19.2 kbps. Nextel uses iDEN to deliver data at a rate of 9.6 kbps. *Sprint Announces Record Fourth Quarter, Yearly Results*, News Release, Sprint, Feb. 1, 2001; Richard Hoffman, *A World Without Wires*, NETWORK COMPUTING, July 10, 2000, available in 2000 WL 11054317; AT&T Wireless, *AT&T Wireless Services: FAQs* (visited Jan. 29, 2001) <http://www.attws.com/business/lcorp/explore/wireless_ip/cust_serv/faqs/csgenfaq.shtml>; Kirk Laughlin, *Can American Wireless Afford 3G?*, AMERICA’S NETWORK, Nov. 15, 2000, available in 2000 WL 10795176.

⁴²⁰ Ian Austen, *The New Wireless Web*, NEW YORK TIMES, Sept. 28, 2000, at G-1.

web users also varies by carrier. Some carriers' plans allow users to access all web sites, while others give users access to only a limited number of sites. This latter method of delivering web content is often called the "walled garden" approach, and the web sites available to users are dictated in part by contracts and arrangements wireless carriers sign with content providers.⁴²¹ AT&T Wireless, on the other hand, allows users who subscribe to their premium service to type any web site address into their phone.⁴²² Even when the full array of available content has been predetermined by carriers, users have some flexibility through customizing their mobile handset screens. Mobile telephone carriers often allow wireless web users to customize their mobile handset screens, so that they can connect to more easily to the web sites they find most relevant.⁴²³ ALLTEL, for instance, allows customers to choose one of four default screens.⁴²⁴

At the end of 2000, over 2.5 million people, or about 2.3 percent of all mobile telephone subscribers, used wireless web services.⁴²⁵ Sprint PCS led the sector with over one million users.⁴²⁶ Sprint PCS claims that 80 percent of the handsets it offers are web-enabled, and approximately 10 percent of its total voice subscribers are using web services.⁴²⁷ Verizon Wireless and AT&T Wireless are the next largest wireless web providers, claiming 750,000 and 459,000 wireless web users, respectively.⁴²⁸

⁴²¹ Dan Meyer, *Speed Bumps; Limits Of Wireless Web Stifle Early Growth*, RCR WIRELESS NEWS, Jan. 29, 2001, at 16. Industry speculation estimates AOL paid Sprint PCS \$50 million "for top billing on subscriber's screens."

⁴²² Users view specially designed content when they surf to wireless-enabled web sites. For web sites that have not been wireless-enabled, some text information is usually available. AT&T Wireless, *AT&T Wireless Services – AT&T Digital PocketNet Service – Data Plans* (date visited May 17, 2001) <http://www.attws.com/personal/exploire/pocketnet/data_plans.html>. Telephone message from Danielle Perry, AT&T Wireless, May 17, 2001.

⁴²³ *ALLTEL Lavishes Users With Choices; Gives Up Sweetheart Content Deals*, CT WIRELESS, Aug. 25, 2000, available in 2000 WL 6392363; *Sprint Introduces "My Wireless Web," A Personal Page to Manage Wireless Phone Content*, News Release, Sprint PCS, Oct. 3, 2000; *Wireless Internet Access Gets Personal*, News Release, Verizon Wireless, Aug. 21, 2000.

⁴²⁴ *ALLTEL Offers First Ready-to-Use Wireless Internet Service; 'Web Unwired' Gives Customers Freedom to Customize Service*, News Release, ALLTEL, Aug. 23, 2000.

⁴²⁵ There were approximately 110 million wireless subscribers by year-end 2000. See Section II.A.1.b(i), Subscriber Growth, *supra*, and note 323, *supra*.

⁴²⁶ Tim Paradis, *Sprint PCS Tops 1M Wireless Web Customers*, DOW JONES NEWSWIRES, Jan. 8, 2001; Arthur B. Krause, Charles Levine and Kurt Fawkes, *SprintPCS Group 4q00 Results Conference Call*, Sprint PCS, Feb. 1, 2001; *Sprint Hits One Million Mobile Users Nationwide on the Sprint PCS Wireless Web*, News Release, Sprint PCS, Jan. 8, 2001.

⁴²⁷ Arthur B. Krause, Charles Levine and Kurt Fawkes, *SprintPCS Group 4q00 Results Conference Call*, Sprint PCS, Feb. 1, 2001.

⁴²⁸ Verizon Communications, Inc., *Verizon Communications Investor Quarterly 4Q '00*, Feb. 1, 2001; AT&T Wireless Group, *AT&T Wireless Group Earnings Commentary*, Jan. 29, 2001.

Sprint PCS and Verizon Wireless began offering wireless web access in 1999.⁴²⁹ Both carriers continued to develop and enhance their offerings during 2000. As of January 2001, Sprint PCS offered 18 Internet-ready phones to its customers,⁴³⁰ more than any other carrier. Also during 2000, Verizon Wireless expanded its mobile data service areas and now offers wireless web services in more than 80 cities nationwide.⁴³¹ Both carriers offer similar wireless web pricing plans. Under these plans, customers pay an additional monthly fee for Internet access, and the Internet access minutes are deducted from the customer's minutes included in their monthly service plans. If customers exceed their allotted monthly minutes, they must pay per-minute airtime charges for wireless web or voice service.⁴³² This type of pricing plan, which is also offered by other carriers, ranges from \$6 to \$14 per month for wireless web access.⁴³³

AT&T Wireless and Nextel initiated mobile web service during the second quarter of 2000.⁴³⁴ Both companies offer "free" wireless web services; meaning their customers pay no additional monthly charge (beyond voice service) for basic wireless web access, and wireless web usage is not deducted from their monthly bucket of voice minutes. In addition, AT&T Wireless and Nextel also offer enhanced mobile Internet services for a monthly fee with features such as e-mail, contact lists, and calendar.⁴³⁵ AT&T Wireless estimates that about 15 to 20 percent of its wireless web users are paying for these enhanced services.⁴³⁶

ALLTEL and Cingular Wireless began offering wireless web services during the third quarter of 2000,⁴³⁷ and VoiceStream rolled out wireless web service in a limited number of markets at the end of 2000.⁴³⁸

⁴²⁹ Hilary Smith, *Dispatch, Data to Drive Carrier Differentiation*, RCR RADIO COMMUNICATIONS REPORT, Oct. 25, 1999, available in 1999 WL 28240970; Bell Atlantic Mobile Introduces New, Simple Choice for Wireless Internet, E-Mail Access, News Release, Verizon Wireless, Nov. 8, 1999.

⁴³⁰ *Sprint and Unplugged Games, Inc. to Launch New Wireless Games On the Sprint PCS Wireless Web*, News Release, Sprint PCS, Jan. 30, 2001.

⁴³¹ Verizon Wireless, *Welcome To Verizon Wireless* (visited Jan. 24, 2001) <http://www.verizonwireless.com/mobileweb/mw_coverage.html>.

⁴³² In addition to paying monthly service fees and airtime charges, all mobile telephone Internet customers must purchase new Internet-ready handsets.

⁴³³ See Appendix D, Table 4, at D-6.

⁴³⁴ *AT&T Wireless Services Introduces Free, Unlimited Access To The Wireless Internet*, News Release, AT&T Wireless, May 17, 2000; *Nextel Introduces Nextel Online(SM): Wireless Internet Service for Business*, News Release, Nextel, Apr. 25, 2000.

⁴³⁵ *AT&T Wireless Services Introduces Free, Unlimited Access To The Wireless Internet*, News Release, AT&T Wireless, May 17, 2000; Nextel, *Nextel Rates* (visited Feb. 23, 2001) <<http://www.nextel.com/rates/rates.shtml>>.

⁴³⁶ *AT&T Wireless 4Q 2000 Earnings Conference Call*, AT&T Wireless, Jan. 29, 2001.

⁴³⁷ *ALLTEL Offers First Ready-to-Use Wireless Internet Service; 'Web-Unwired' Gives Customers Freedom to Customize Service*, News Release, ALLTEL, Aug. 23, 2000; Jon Van, *Cautious Attraction to Wireless Web*, CHICAGO TRIBUNE, Oct. 19, 2000, available in 2000 WL 3722847.

⁴³⁸ *2001 Strategis Mobile Data Report*, at 43.

During the first quarter of 2001, Cingular Wireless and ALLTEL offered free wireless web service for a limited time to new customers.⁴³⁹ Otherwise, all three companies offer pricing plans similar to those of Sprint PCS and Verizon Wireless.

(ii) SMS

SMS provides the ability to send and receive text messages to and from mobile handsets with message length ranging from 120 to 256 characters.⁴⁴⁰ SMS also can be used to deliver a wide range of information to mobile users, including stock prices, sport scores, news headlines, weather reports, and horoscopes. Worldwide, SMS has become increasingly popular, growing from 3 billion messages sent in December 1999 to 15 billion messages in December 2000.⁴⁴¹

Two-way SMS was not introduced in the United States until 2000. VoiceStream was the first to offer this service, beginning in May 2000.⁴⁴² Verizon Wireless and AT&T Wireless introduced two-way SMS services during the fourth quarter of 2000.⁴⁴³ More recently, TeleCorp began offering two-way SMS in limited areas on its network during the first quarter of 2001.⁴⁴⁴ VoiceStream now offers an SMS-like service called e-notes; e-notes allows VoiceStream subscribers to send short e-mail messages to other VoiceStream subscribers, to any wireless phone with an e-mail address and to any Internet e-mail address.⁴⁴⁵

Pricing plans for SMS vary by mobile telephone carrier, and are incurred in addition to monthly voice and/or wireless web service plan fees. Subscribers typically pay different prices to send and receive messages, although providers often charge a fixed monthly fee for a set number of messages.⁴⁴⁶ Both

⁴³⁹ ALLTEL offers wireless Internet in Mobile, Pensacola areas, News Release, ALLTEL, Jan. 29, 2001; Cingular, My Wireless Window – Wireless Internet – Pricing (visited Feb. 2, 2001) <<http://www.mywirelesswindow.com/myww/pricing>>.

⁴⁴⁰ Andrew M. Seybold, *Short Messaging Service (SMS)*, MOTHERING MAGAZINE, June 25, 1999. GSM networks permit messages of 160 characters, CDMA permits 256 characters, and iDEN allows 140 characters. SSB Report, at 30; Verizon Wireless Introduces Mobile Messenger(SM) in Texas and Coast to Coast; Let Your Fingers Do the Talking With Two-Way Text Messaging, News Release, Verizon Wireless, Jan. 29, 2001. U.S. carriers have set varying character limits. For example, Verizon Wireless limits users to 120 characters.

⁴⁴¹ 3 Billion G-Mails in December '99; Short Messages Hit the Mark For Consumers, News Release, GSM Association, Feb. 2, 2000; More Than 200 Billion GSM text messages forecast for full year 2001, News Release, GSM Association, Feb. 12, 2001.

⁴⁴² VoiceStream Wireless Launches Wireless Internet Services, News Release, VoiceStream, May 10, 2000.

⁴⁴³ AT&T Wireless Brings the International Text Messaging Craze to the U.S., News Release, AT&T Wireless, Oct. 17, 2000; Verizon Wireless Customers Can Now Let Their Fingers Do The Talking, News Release, Verizon Wireless, Nov. 30, 2000.

⁴⁴⁴ TeleCorp PCS Introduces Two-Way Short Messaging Service, News Release, TeleCorp, Feb. 27, 2001.

⁴⁴⁵ VoiceStream, VoiceStream – products & services (visited Feb. 28, 2001) <<http://www.voicestream.com/products/services/atstream.asp>>.

⁴⁴⁶ In addition to paying service plan fees, customers must also purchase handsets capable of text messaging.

Verizon Wireless and AT&T Wireless offer two SMS pricing plans. Verizon Wireless offers customers a plan for \$2.99 per month to send and receive 100 messages and a plan for \$7.99 per month for 600 messages. With both plans, additional sent messages are \$0.10 and received messages are \$0.02.⁴⁴⁷ AT&T Wireless offers a plan that allows subscribers to receive 250 messages for free and pay \$0.10 per sent or additional received messages. Alternatively, customers can pay \$4.99 for 500 sent or received messages and \$0.10 per additional message.⁴⁴⁸

At the end of 2000, Sprint PCS began offering AOL Instant Messenger, an SMS-type service, to its mobile customers.⁴⁴⁹ Instant messaging (“IM”) services, such as AOL Instant Messenger (“AIM”), enable users to send and receive messages within a community of users, creating a chat-style atmosphere, whereas SMS is communication between two individuals.⁴⁵⁰ Sprint PCS phones give AIM users functions similar to those offered on PCs. From their Sprint PCS mobile phone, an AIM user is able to tell whether or not someone from their “buddy list” – a list of other AIM users with whom the initial user communicates – is online. In addition, AIM users can communicate with their “buddies” regardless of whether the buddies are on a PC or on a Sprint PCS mobile phone.⁴⁵¹ VoiceStream has also partnered with AOL to deliver AIM service to its customers starting in May 2001.⁴⁵²

(iii) E-mail

As an enhancement to SMS and wireless web services the seven mobile telephone carriers discussed in section II.B.2.a. offer e-mail access via wireless devices. E-mails can be sent and received using a mobile handset. Customers are assigned an e-mail address that can be customized and maintained using their mobile device or through a wired Internet connection. Each of the mobile telephone carriers, except VoiceStream, bundles e-mail and related functions with wireless web service, and therefore does not charge for e-mail separately. VoiceStream offers e-mail as part of its e-notes service, discussed above. For example, Nextel allows its paid wireless web customers to access e-mail accounts from their mobile phones. Users can access a select group of Internet Service Provider e-mail accounts, such as Earthlink, Inc. (“Earthlink”), Mindspring, and Prodigy. In addition, Nextel users can access e-mail accounts that use POP3 protocol.⁴⁵³

⁴⁴⁷ Verizon Wireless Introduces Mobile Messenger(SM) in Texas and Coast to Coast; *Let Your Fingers Do the Talking With Two-Way Text Messaging*, News Release, Verizon Wireless, Jan. 29, 2001.

⁴⁴⁸ AT&T Wireless Brings the International Text Messaging Craze to the U.S., News Release, AT&T Wireless, Oct. 17, 2000.

⁴⁴⁹ Sprint and America Online Launch the AOL Instant Messenger Service on the Sprint PCS Wireless Web, News Release, Sprint PCS, Oct. 19, 2000.

⁴⁵⁰ Devine Kofiloto and Mike Woolfrey, ‘SMS – unexploited potential’ *Messaging conference hears*, EMC Market Data, Jan. 31, 2001.

⁴⁵¹ eCare, E-mail correspondence, Sprint PCS, May 16, 2001.

⁴⁵² Jason Philyaw, *VoiceStream To Offer AOL Instant Message To Customers*, DOW JONES NEWSWIRE, May 21, 2001.

⁴⁵³ POP3 is a protocol for receiving e-mail that is used by many companies and ISPs. Nextel, *Nextel – Mobile Email* (visited Mar. 29, 2001) <<http://www.nextel.com/wireless/email/emailandmore.shtml>>.

c. Handheld Devices

Several handheld PDA devices currently offer users a wireless connection to the Internet, either through a built-in wireless modem, through a separate wireless modem attachment, or by attaching a mobile telephone to the PDA.⁴⁵⁴ Like web-enabled mobile phones, these devices provide users with access to e-mail and web content⁴⁵⁵ while mobile. Handheld devices generally have larger screens and greater functionality⁴⁵⁶ than mobile telephones but do not have a built-in voice component.⁴⁵⁷

The three principal categories of handheld devices with a wireless Internet connection are: 1) devices that use the PalmOS operating system, including the Palm devices and the Handspring Visor; 2) devices made by RIM that run RIM's BlackBerry service; and 3) devices that run Microsoft's Pocket PC or Windows CE operating system. The *Fifth Report* discussed the first three categories of devices. New to the section this year is the Handspring Visor, which can now achieve wireless Internet access with the attachment of a wireless modem card, an advanced messaging device, or a mobile phone. Since the writing of the *Fifth Report*, manufacturers Palm, RIM, and Pocket PC have begun to offer additional handheld devices with wireless Internet connectivity and have expanded their Internet-based content and services. Palm claimed a 61 percent market share of all handheld retail sales made during January 2001, Handspring claimed 26 percent, and Pocket PC manufacturers claimed a combined 9 percent.⁴⁵⁸

(i) PalmOS Devices

There are two handheld devices manufacturers who run the PalmOS operating system: Palm and Handspring. Palm currently offers three ways to access the Internet wirelessly with its different handheld models. First, the Palm VIIx,⁴⁵⁹ an updated version of the Palm VII discussed in the *Fifth Report*, has a

⁴⁵⁴ See Appendix D, Table 9, at D-11 for an overview of handheld devices with mobile Internet access.

⁴⁵⁵ As with Internet access via mobile telephones, the content available on handheld devices with mobile Internet access differs from the content available with wireline web access and varies by device and wireless Internet service provider. See Section II.B.2.b(i), Wireless Web. The type of mobile Internet content available on various handheld devices is described below.

⁴⁵⁶ Handheld PDAs generally include the PDA functions described in note 320, *supra*.

⁴⁵⁷ One handheld device discussed below, the Handspring Visor, allows users to attach a VisorPhone to the handheld device, thereby giving them mobile voice and Internet access. See Section II.B.2.c(i), PalmOS Devices, *infra*.

⁴⁵⁸ R. Gardner, *Handheld Devices: The PDA Weekly*, Salomon Smith Barney, Feb. 23, 2001, at 2. These market share percentages include only point-of-sale cash register sales made at retailers such as CompUSA, Office Depot, etc. plus certain mail order catalogs. It does not include the other sales channels used by RIM; therefore, sales of RIM's blackberry devices are not included. E-mail communication with Cynthia S. Hiponia, Associate, Salomon Smith Barney, May 25, 2001.

⁴⁵⁹ At the beginning of 2001, the list price of the Palm VIIx was \$399, an 11 percent decrease from the \$450 price of the Palm VII in the spring of 2000. In addition, in February 2001, Palm began offering a \$100 rebate on the Palm VIIx with a 12-month subscription to Palm.net. See R. Gardner, *Handheld Devices: The PDA Weekly*, Salomon Smith Barney, Feb. 23, 2001, at 1; Palm, *Palm VII Series* (visited Mar. 16, 2001) <<https://store.palm.com/Catalog/>>; *Fifth Report*, at 17723. Palm has made few changes to its Palm.Net monthly service pricing since the *Fifth Report*. For \$44.99 per month, subscribers can get unlimited Internet access, and for \$9.99 per month, they can download 50 kilobytes (or about 150 screens) of content. Palm changed its mid-level

built-in wireless modem that gives Palm VIIx and Palm VII users access the Internet at speeds of 9 kbps through Palm's Palm.Net service.⁴⁶⁰ Palm.Net includes web clipping applications, which allow users to view over 580 web-clipped Internet sites,⁴⁶¹ and mobile e-mail access to a Palm.net account.⁴⁶² Palm.Net service connects to the data network of Cingular Interactive and can be used in 260 cities nationwide with no roaming charges.⁴⁶³

Users of Palm's other PDAs, including the Palm m105, Palm III, and Palm V series, can connect to the Internet by attaching a mobile phone or wireless modem to their devices, but do not receive Palm's Palm.net service. However, Palm users who connect to the Internet by attaching a mobile phone (with either a cable or infrared signal)⁴⁶⁴ can reach over 450 web-clipped sites,⁴⁶⁵ send and receive e-mail messages with Palm's MultiMail software and a Hotmail, Earthlink, or Yahoo!, Inc. ("Yahoo") account,⁴⁶⁶ and, if they use a GSM handset, can send and receive text messages with SMS.⁴⁶⁷ Palm III and Palm V

pricing plan from \$39.95 for 300 kilobytes, to \$24.99 for 150 kilobytes (or about 450 screens). Palm, *Palm.Net Service Plans* (visited Mar. 16, 2001) <<http://www.palm.com/products/palmvii/serviceplans.html>>.

⁴⁶⁰ Marge Brown, *Palm/Handspring: Services*, PC MAGAZINE, Mar. 29, 2001, available in 2001 WL 4946173.

⁴⁶¹ Web clipping allows Palm devices to display small amounts of text information from popular Internet sites that have been specially designed for the proprietary Palm platform. Users can access information from these sites but cannot surf beyond them. See *Fifth Report*, at 17723. The web clipping applications of Palm's content partners come pre-loaded on the Palm VIIx and give users access to sites such as Yahoo!, E*Trade, Travelocity, ABCNEWS.com, and ESPN.com. See Palm, *Web Clipping Applications* (visited Mar. 16, 2001) <<http://www.palm.com/products/palmvii/webclipping.html>>; Palm, *Web Clipping Application Partners* (visited Mar. 16, 2001) <http://www.palm.com/products/palmvii/qa_logos.html>.

⁴⁶² Palm, *Palm.Net Wireless Communication Service* (visited Mar. 16, 2001) <<http://www.palm.com/products/palmvii/wireless.html>>. Palm.net's e-mail product is called iMessenger. With iMessenger, Palm.Net subscribers can automatically receive the first 500 characters of each message sent to their personal Palm.Net e-mail account, and then have the option to read the next 500 characters, download the entire message, or read it later. Palm, *iMessenger Wireless Internet Messaging* (visited Mar. 16, 2001) <<http://www.palm.com/products/palmvii/imessenger.html>>.

⁴⁶³ See *Fifth Report*, at 17723; Palm, *Palm.Net Service Coverage* (visited Apr. 2, 2001) <<http://www.palm.com/products/palmvii/map.html>>.

⁴⁶⁴ Users who connect through a mobile phone must also install Palm's Mobile Internet Kit software. Palm, *Palm Mobile Internet Kit* (visited Mar. 16, 2001) <<http://www.palm.com/software/mik/>>; Palm, *Palm m105 Handheld* (visited Mar. 16, 2001) <<https://store.palm.com/Catalog/>>. See Palm, *Palm Mobile Internet Kit* (visited Mar. 16, 2001) <<http://www.palm.com/software/mik/phone.html>> for a list of mobile handsets that can be attached to Palm devices, and the type of connection (either cable or infrared) that each uses.

⁴⁶⁵ Palm, *Palm Mobile Internet Kit FAQs* (visited Mar. 16, 2001) <<http://www.palm.com/software/mik/faq.html#3>>; Palm, *Palm Mobile Internet Kit* (visited Mar. 16, 2001) <<http://www.palm.com/software/mik/>>.

⁴⁶⁶ *Id.*

⁴⁶⁷ With Palm devices, users can store and retrieve their SMS messages. Palm, *Palm Mobile Internet Kit FAQs* (visited Mar. 16, 2001) <<http://www.palm.com/software/mik/faq.html#3>>. When users are piggybacking on the mobile telephone's mobile Internet connection, many factors associated with the connections, including speed,

series users can also connect to the Internet by attaching a wireless modem card, such as those made by Minstrel, to their handheld devices.⁴⁶⁸ Wireless modem card users can receive mobile access to web content and e-mail messages, as well as access to corporate intranets and databases, at speeds of around 19.2 kbps.⁴⁶⁹ Palm V Minstrel users can also choose between GoAmerica⁴⁷⁰ or OmniSky Corporation (“OmniSky”)⁴⁷¹ as their wireless Internet service provider (“WISP”).⁴⁷²

While Handspring’s PDA, the Visor, uses the same operating system as the Palm devices, the Visor has a Springboard, a place on the device where users can attach various modules. Springboard modules include attachments used for mobile communication as well as other types of attachments, such as digital cameras, MP3 players, Global Positioning System (“GPS”) devices, games, and e-books.⁴⁷³ The Visor can access the web and e-mail wirelessly with the attachment of one of three different types of Springboard modules: a

reliability, and service pricing, are dependent upon the mobile telephone carrier providing the Internet access. Palm does not charge a monthly service fee for this type of access; however, Palm Mobile Internet Kit users must pay whatever wireless web access fees their mobile telephone carrier charges. Palm, *Palm Mobile Internet Kit FAQs* (visited Mar. 16, 2001) <<http://www.palm.com/software/mik/faq.html#3>>. See Section II.B.2.b, Mobile Telephone Operator Offerings, *supra*.

⁴⁶⁸ Palm, *Wireless Internet and E-mail* (visited Mar. 16, 2001) <<http://www.palm.com/wireless/>>. The Minstrel V and Minstrel III work with the Palm V and Palm III, respectively. Both Minstrel modems cost \$369. All of Minstrel wireless modems are made by Novatel Wireless, Inc. (“Novatel”) and use CDPD networks for mobile Internet access. Novatel, *Minstrel V* (visited Mar. 16, 2001) <<http://www.novatelwireless.com/palmtop/minstrel5.html>>; Novatel, *Minstrel III* (visited Mar. 16, 2001) <<http://www.novatelwireless.com/palmtop/minstrel3.html>>.

⁴⁶⁹ Novatel, *Minstrel V* (visited Mar. 16, 2001) <<http://www.novatelwireless.com/palmtop/minstrel5.html>>; Novatel, *Minstrel III* (visited Mar. 16, 2001) <<http://www.novatelwireless.com/palmtop/minstrel3.html>>. In the future, Palm and Motient plan to offer a Palm V cradle that will have always-on wireless Internet access to Motient’s wireless data network. *Motient to Provide Palm Users with Wireless Connectivity*, PR NEWswire, Feb. 7, 2001.

⁴⁷⁰ GoAmerica’s Go.Web gives users access to a new Go.Web e-mail account or to an existing web-based e-mail account, and to nearly any web site that has been designed for use on a mobile device. GoAmerica, *Go.Web Service* (visited Mar. 19, 2001) <<http://www.goamerica.com/goweb/>>. Go.Web allows users to customize the content they wish to receive through its MyGo.Web portal. GoAmerica, *Go.Web Service* (visited Mar. 19, 2001) <<http://www.goamerica.com/goweb/>>.

⁴⁷¹ OmniSky provides e-mail access to an existing web-based or Microsoft Outlook e-mail account. OmniSky, *Wireless E-mail & Internet* (visited Mar. 19, 2001) <<http://www.omnisky.com/products/>>. Like GoAmerica, OmniSky allows users to access a variety of web content that has been designed for mobile devices and to personalize the content they receive with My OmniSky. OmniSky, *Wireless E-mail & Internet* (visited Mar. 19, 2001) <<http://www.omnisky.com/products/>>.

⁴⁷² OmniSky, *Wireless E-mail & Internet* (visited Mar. 19, 2001) <<http://www.omnisky.com/products/>>; GoAmerica, *Novatel Wireless Minstrel V* (visited Mar. 19, 2001) <<http://www.goamerica.net/showcase/minstrel5/>>. Like many landline ISPs, WISPs GoAmerica and OmniSky are neither carriers nor equipment manufacturers but instead provide their subscribers with access to the Internet, including web content and e-mail, from various mobile devices discussed in Section II.B.2.c.

⁴⁷³ Handspring, *Springboard Modules* (visited Mar. 18, 2001) <<http://www.handspring.com/products/sbmodules/index.jhtml>>.

CDPD wireless modem card such as the Minstrel S, a Glenayre Technologies, Inc. ("Glenayre") @ctivelink advanced messaging module, or the VisorPhone.⁴⁷⁴ Visor users can choose from three wireless Internet services to use with the Minstrel wireless modem: GoAmerica, OmniSky, or YadaYada.⁴⁷⁵ Glenayre's @ctivelink module allows Visor users to send and receive e-mail messages, and receive web content updates, such as sports scores, weather reports, and stock quotes.⁴⁷⁶ The @ctivelink module connects to Arch Wireless's two-way wireless data network.⁴⁷⁷ The VisorPhone module allows the Visor to function as a mobile telephone and gives users a mobile voice as well as data connection. VisorPhone users can check e-mail, send and receive SMS messages, and access the web at 14.4 kbps.⁴⁷⁸ The VisorPhone connects to the GSM networks operated by VoiceStream and Cingular Wireless.⁴⁷⁹

(ii) RIM Devices and BlackBerry Service

RIM currently manufactures and sells four models of handheld devices – the RIM 957, the RIM 857, the RIM 950, and RIM 850 – all of which connect to the Internet wirelessly using built-in wireless modems.⁴⁸⁰ The RIM 950 and RIM 850 are similar in size to two-way advanced messaging devices, while the RIM 857 and RIM 957 are similar to the handheld PDA devices discussed in this section. All four devices have PDA organizer software and full QWERTY keypads. RIM offers mobile Internet access service for the RIM 850 and RIM 857 over Motient's DataTAC network, while the RIM 950 and RIM 957 operate using Cingular Interactive's Mobitex network.⁴⁸¹

⁴⁷⁴ Handspring, *Springboard Modules Communications and Wireless* (visited Mar. 18, 2001) <<http://www.handspring.com/products/sbmodules/CommunicationsAndWireless.jhtml>>; Handspring, *Give Your Visor a Dial Tone* (visited Mar. 18, 2001) <<http://www.handspring.com/products/visorphone/index.jhtml>>.

⁴⁷⁵ Handspring, *Springboard Modules Communications and Wireless* (visited Mar. 18, 2001) <<http://www.handspring.com/products/sbmodules/CommunicationsAndWireless.jhtml>>.

⁴⁷⁶ Handspring, *@ctivelink Wireless Messaging Module* (visited Mar. 18, 2001) <<http://www.handspring.com/products/sbmodules/activelinkdetails.jhtml>>. Glenayre announced in May 2001 that it planned to exit the wireless messaging business over the coming year and instead focus on providing access to voicemail and e-mail via the Internet and cellular phones. *Paging Firm Glenayre to Cut 700 Jobs*, REUTERS, May 23, 2001.

⁴⁷⁷ *Arch Wireless Introduces the 'Arch Webster™ 300' With the Glenayre @ctiveLink™ Module*, PR NEWswire, Mar. 21, 2001. See Section II.B.2.a, *Paging/Messaging*, *supra*.

⁴⁷⁸ Handspring, *Give Your Visor a Dial Tone* (visited Mar. 18, 2001) <<http://www.handspring.com/products/visorphone/index.jhtml>>.

⁴⁷⁹ Handspring, *VisorPhone FAQs* (visited Mar. 18, 2001) <<http://www.handspring.com/products/visorphone/faqs.jhtml>>; Rob Pegoraro, *Handheld Meets Phone, With Promising Results*, THE WASHINGTON POST, Mar. 9, 2001. The Minstrel wireless modems and VisorPhone cost \$299 each, and the @ctivelink module costs \$179. Handspring, *Springboard Modules Communication and Wireless* (visited Apr. 24, 2001) <<http://www.handspring.com/products/sbmodules/CommunicationsAndWireless.jhtml>>.

⁴⁸⁰ RIM, *Available Services* (visited Mar. 18, 2000) <<http://www.rim.net/products/handhelds/services/index.shtml>>.

⁴⁸¹ See Section II.B.2.d, *Dedicated Data Networks*, *infra*, for a discussion of Motient and Cingular Interactive.

All of RIM's devices include RIM's BlackBerry e-mail service.⁴⁸² BlackBerry allows users to receive, compose, send, file, and filter messages from existing e-mail accounts while mobile. RIM offers two versions of BlackBerry – one for businesses and one individual consumers.⁴⁸³ BlackBerry is available from RIM, as well as several resellers, including Cingular Interactive, Motient, GoAmerica, Compaq Computer Corporation ("Compaq"), Earthlink, Amazon.com, Inc., Handango, Inc., Aether Systems, Inc., and Vaultus, Inc., many of whom offer co-branded versions of the BlackBerry service.⁴⁸⁴ Many of these co-branded services include access to web content and intranets, as well as e-mail.⁴⁸⁵ In addition to the BlackBerry partnerships, RIM has formed a partnership with AOL in which AOL offers its AOL Mobile Messenger service, which includes mobile access to AOL e-mail and AIM, on RIM's devices.⁴⁸⁶

(iii) Pocket PC Devices

As mentioned in the *Fifth Report*, Microsoft launched its latest handheld operating system, Pocket PC, in April 2000. Pocket PC is an updated version of Windows CE and includes PDA versions of many of Microsoft's desktop software applications, including Word, Excel, Outlook, and Internet Explorer. Three companies, Hewlett-Packard ("HP"), Casio, Inc. ("Casio"), and Compaq, currently manufacture handheld

⁴⁸² RIM, *Available Services* (visited Mar. 18, 2000) <<http://www.rim.net/products/handhelds/services/index.shtml>>.

⁴⁸³ RIM, *BlackBerry Enterprise Solutions* (visited Mar. 18, 2001) <<http://www.blackberry.net/solutions/enterprise/index.shtml>>; RIM, *BlackBerry Home/Personal Solutions* (visited Mar. 18, 2001) <<http://www.blackberry.net/solutions/home/index.shtml>>; RIM, *Wireless E-mail Solutions* (visited Mar. 18, 2001) <<http://www.blackberry.net/solutions/index.shtml>>. BlackBerry Enterprise Edition is for businesses and BlackBerry Internet Edition for individual customers. Enterprise Edition is designed for use with Microsoft Exchange or Lotus Domino and can be integrated with corporate servers. Individual BlackBerry e-mail service costs \$39.99 per month, and services such as paging and North American roaming cost extra. RIM, *BlackBerry Exchange Edition* (visited Mar. 18, 2000) <<http://www.blackberry.net/purchase/pricing/us/bbee.shtml>>.

⁴⁸⁴ RIM, *BlackBerry eMarketplace* (visited Mar. 18, 2001) <<http://www.blackberry.net/purchase/emarketplace/index.shtml>>; *Research In Motion Reports 45% Sequential Revenue Growth in Q3*, News Release, RIM, Dec. 20, 2000; RIM, *BlackBerry Flat-Rate Pricing* (visited Mar. 18, 2000) <<http://www.blackberry.net/purchase/pricing/index.shtml>>.

⁴⁸⁵ Some of the co-branded BlackBerry services are only available on certain RIM devices. RIM, *BlackBerry eMarketplace GoAmerica* (visited Mar. 18, 2001) <<http://www.blackberry.net/purchase/emarketplace/resellers/us/goamerica.shtml>>; RIM, *BlackBerry eMarketplace Cingular* (visited Mar. 18, 2001) <<http://www.blackberry.net/purchase/emarketplace/resellers/us/cingular.shtml>>. Compaq has co-branded not only RIM's BlackBerry service, but two of its devices as well. It has branded the RIM 950 as the iPAQ W1000 and the RIM 957 as the iPAQ H1000, and offers the iPAQ BlackBerry Wireless E-mail Solution on both. RIM, *BlackBerry eMarketplace Compaq* (visited Mar. 18, 2001) <<http://www.blackberry.net/purchase/emarketplace/resellers/us/compaq.shtml>>. GoAmerica has added its wireless Internet service, Go.Web, to BlackBerry, so users can access the web and corporate intranets, as well as existing e-mail accounts, on the RIM 850, RIM 950, and RIM 957. RIM, *BlackBerry eMarketplace GoAmerica* (visited Mar. 18, 2001) <<http://www.blackberry.net/purchase/emarketplace/resellers/us/goamerica.shtml>>. The co-branded BlackBerry services offered by Cingular Interactive and Motient are discussed in Section II.B.2.d, *infra*.

⁴⁸⁶ *Research In Motion Reports 45% Sequential Revenue Growth in Q3*, News Release, RIM, Dec. 20, 2000; *America Online Unveils New AOL Mobile Communicator Two-way Wireless Handheld Device*, News Release, RIM, Nov. 30, 2000.

devices that run Pocket PC and that can connect to the Internet wirelessly.⁴⁸⁷ These devices, the HP Jornada, the Casio E-125, and the Compaq iPAQ, do not have built-in wireless modems, but require separate wireless modem attachments in order to access the Internet. The HP Jornada uses a Minstrel 540 wireless modem,⁴⁸⁸ the Casio E-125 requires a Nextcell PocketSpider modem,⁴⁸⁹ and the Compaq iPAQ requires a PC Card Expansion Pack and Sierra Wireless Aircard 300.⁴⁹⁰ Both the Casio E-125 and the Compaq iPAQ use GoAmerica as their WISP.⁴⁹¹ HP Jornada users can choose between GoAmerica or OmniSky.⁴⁹²

d. Dedicated Data Networks

There are a number of operators offering mobile data services over dedicated data networks. A number of these networks began by initially serving vertical markets such as asset tracking and field service and have evolved to serve horizontal markets such as messaging and Internet access. The three major dedicated data network providers are Motient, Cingular Interactive, and Metricom.

(i) Motient

Motient provides mobile data services to a variety of users including messaging to mobile professionals, as well as telemetry, transportation, and field services.⁴⁹³ It operates in the 800 MHz SMR band.⁴⁹⁴ In April 2000, RIM announced it would use Motient's DataTAC network to provide wireless Internet connectivity to its RIM 850 and RIM 857 BlackBerry subscribers.⁴⁹⁵ Motient also co-brands RIM's BlackBerry e-mail service, calling it "BlackBerry by Motient." In addition, Motient provides a two-way messaging and e-mail service called eLink and recently introduced "eLink Fortified with Yahoo."⁴⁹⁶ Through this service,

⁴⁸⁷ Microsoft, *Mobile Devices, Get Connected* (visited Mar. 16, 2001) <<http://www.microsoft.com/mobile/pocketpc/wireless/connected.asp>>.

⁴⁸⁸ Novatel, *Minstrel 540* (visited Mar. 16, 2001) <<http://www.novatelwireless.com/palmtop/minstrel540.html>>. Like the Minstrel V and Minstrel III discussed above, the Minstrel 540 uses CDPD networks and transfers data at speeds of 19.2 kbps. *Id.*

⁴⁸⁹ Casio, *PocketSpider GoAmerica Wireless Internet Services* (visited Mar. 16, 2001) <<http://www.casio.com/pocketspider/>>.

⁴⁹⁰ Compaq, *Accessories* (visited Mar. 16, 2001) <<http://www5.compaq.com/products/handhelds/pocketpc/accessories.html#wireless>>.

⁴⁹¹ Microsoft, *Mobile Devices, Get Connected* (visited Mar. 16, 2001) <<http://www.microsoft.com/mobile/pocketpc/wireless/connected.asp>>.

⁴⁹² *Id.*

⁴⁹³ Motient Corporation, SEC Form 10-Q, Nov. 14, 2000. Motient provides wireless voice services via its satellite subsidiary. *Id.* Motient was formerly known as American Mobile Satellite Corporation and included the acquisition of ARDIS Company. Motient Corporation, SEC Form 10-Q, May 15, 1998.

⁴⁹⁴ Motient Corporation, SEC Form 10-K, Apr. 2, 2001.

⁴⁹⁵ 2001 *Strategis Mobile Data Report*, at 67. See Section II.B.2.c(ii), RIM Devices and BlackBerry Service, *supra*.

subscribers can send and receive Yahoo mail and instant messages as well as access Yahoo content and services.⁴⁹⁷ GoAmerica and Aether also co-brand RIM devices using Motient's network.⁴⁹⁸ Finally, Palm uses Motient's network to connect its Palm V and VII users to the Internet and other Palm.net applications.⁴⁹⁹

At year-end 2000, Motient had more than 45,000 eLink subscribers compared to fewer than 3,000 at year end 1999.⁵⁰⁰

(ii) Cingular Interactive

Cingular Interactive operates as a business unit of Cingular Wireless.⁵⁰¹ Cingular Interactive offers a variety of mobile data services including advanced messaging and, similar to Motient, provides wireless Internet connectivity for RIM 950 and RIM 957 BlackBerry and Palm VII handheld devices through its Mobitex network operating in the 900 MHz band. In addition, Fidelity and AOL use Cingular Interactive's network to provide services to wireless devices.⁵⁰² AOL Mobile Communicator permits AOL members to check their e-mail and exchange instant messages.⁵⁰³ During 2000, Cingular Interactive introduced a co-branded RIM BlackBerry service called MyBiz Interactive offering messaging and e-mail services.⁵⁰⁴

During 2000, the company added 90,000 subscribers on average per quarter.⁵⁰⁵ By year end, the company had more than doubled its subscriber base, closing the year with more than 570,000 MyBiz Interactive, Palm.Net, Fidelity, AOL Mobile Communicator, and RIM BlackBerry subscribers compared to 200,000 at year end 1999.⁵⁰⁶

⁴⁹⁶ Peggy Albright, *Motient's Big Push for a Consumer Base*, WIRELESS WEEK, Jan. 15, 2001.

⁴⁹⁷ Motient (visited Mar. 14, 2001) <<http://www.motient.com>>.

⁴⁹⁸ RIM, *BlackBerry* (visited Mar. 14, 2001) <<http://www.blackberry.net/purchase/emarketplace/resellers/us>>.

⁴⁹⁹ Mike Mayor, *New Cradle to Keep Palm Users Turned On*, WIRELESS NEWS FACTOR, Feb. 8, 2001. See also Section II.B.2.c(i), *PalmOS Devices*, *supra*.

⁵⁰⁰ Motient Corporation, SEC Form 10-K, Apr. 2, 2001, at F-5.

⁵⁰¹ *BellSouth Wireless Data Brings in New Year with New Name – Cingular Interactive*, News Release, Cingular Interactive, Jan. 10, 2001.

⁵⁰² *Cingular Interactive's Subscriber Count Eclipses 570,000 as Company Celebrates Banner Year*, News Release, Cingular Interactive, Jan. 23, 2001 ("*Cingular Interactive News Release*").

⁵⁰³ *Id.*

⁵⁰⁴ *Id.*

⁵⁰⁵ *Cingular Interactive Introduces Operation Platinum Standard to Continue Meeting Service and Coverage Needs*, News Release, Cingular Interactive, Feb. 5, 2001.

⁵⁰⁶ *Cingular Interactive News Release*.

(iii) Metricom

Metricom offers mobile data services using the 900 MHz and 2.4 GHz unlicensed bands, as well as 2.3 GHz Wireless Communications Service (“WCS”) licensed spectrum. The company’s primary service offering, Ricochet, offers mobile access to the Internet and to corporate networks via a wireless modem attached to a laptop.⁵⁰⁷ In the third quarter of 2000, Metricom launched its new Ricochet service, which operates at average speeds of 128 kbps, in nine markets across the United States.⁵⁰⁸ The new service is now available in 13 markets, including Atlanta, Baltimore, Denver, Los Angeles, Minneapolis, New York City, and San Francisco.⁵⁰⁹ Metricom continues to operate its 28.8 kbps speed service in portions of San Francisco and in the Seattle and Washington, D.C. metropolitan areas while these markets are converted to 128 kbps service.⁵¹⁰ Metricom has announced plans to ultimately launch the 128 kbps service in a total of 46 metropolitan areas.⁵¹¹ The monthly subscription fee for Ricochet’s 128 kbps service ranges from \$44.95 to \$79.95.⁵¹²

A number of companies resell Metricom’s services including WorldCom, Juno, SkyTel, UUNet, Wireless WebConnect!, GoAmerica, EarthLink, and Compaq.⁵¹³ At the end of 2000, Metricom had 34,000 subscribers, including 12,200 128 kbps service subscribers.⁵¹⁴ By comparison, in 1999 Metricom had 29,700 subscribers, all of which were for its 28.8 kbps service.⁵¹⁵

3. Developing Mobile Data Services

The technologies and services discussed below are largely in development and not offered on a large scale, at least not in the United States. As they evolve, they will likely play a larger role in the mobile data industry.

a. WAP

Wireless Application Protocol, or WAP, is a set of technologies that allows mobile phones, handheld PDAs, and other portable devices to access the Internet. LM Ericsson Telephone Company (“Ericsson”),

⁵⁰⁷ Metricom, Inc., SEC Form 10-Q, Nov. 13, 2000, at 11.

⁵⁰⁸ *Id.*

⁵⁰⁹ Metricom, Inc., SEC Form 10-K, Apr. 30, 2001, at 1.

⁵¹⁰ *Id.*

⁵¹¹ Metricom, Inc., SEC Form 10-Q, Nov. 13, 2000, at 11.

⁵¹² *San Diego Gains Competitive Advantage...*, News Release, Metricom, Inc., May 17, 2001; Metricom, *Get Ricochet* (visited May 22, 2001) <[wysiwyg://19/http://www.ricochet.com/ric...t_advantage/getricochet/matrix_live.html](http://www.ricochet.com/ric...t_advantage/getricochet/matrix_live.html)>.

⁵¹³ Metricom, *Metricom Partners and Resellers* (visited Apr. 25, 2001) <http://www.metricom.com/partners_resellers/index.html>.

⁵¹⁴ *Metricom Reports Fourth Quarter 2000 Results*, News Release, Metricom, Feb. 8, 2001.

⁵¹⁵ *Id.*

Nokia Corp. (“Nokia”), Motorola, all equipment manufacturers; and Openwave Systems,⁵¹⁶ a software company, founded the WAP Forum in June 1997 to establish a global, open industry standard for bringing the Internet to handheld devices and wireless phones. WAP is a “technology enabler,” meaning that it is not a product itself but a set of non-proprietary standards that the entire wireless data industry can use to develop its products. The goal of WAP has been to allow all wireless devices, regardless of their manufacturer or network, to access the Internet in essentially the same way.

As mentioned in the *Fifth Report*, WAP is a means of helping the wireless industry overcome the challenges of accessing the Internet from a handheld device or mobile phone.⁵¹⁷ Since 1997, more than 600 companies have joined the WAP Forum,⁵¹⁸ including mobile telephone and data carriers with more than 300 million subscribers worldwide.⁵¹⁹ As of October 2000, there were at least 35 types of WAP-enabled phones available worldwide from the major equipment manufacturers.⁵²⁰ In addition, 40 different WAP-enabled handset models are in production, but not yet commercially available.⁵²¹

While WAP has many positive features, some members of the wireless industry note that certain problems have arisen with the implementation of the standard. For example, the way in which vendors have integrated WAP into their products has sometimes made those products incompatible with others.⁵²² Another criticism of WAP has been the lack of an end-to-end security solution to enable m-commerce applications.⁵²³ As a result of these problems, WAP has received some negative reviews within the industry,⁵²⁴ particularly regarding rollout of WAP in Europe.⁵²⁵ However, many still believe WAP will be

⁵¹⁶ Openwave Systems was formed by the November 17, 2000, merger between Phone.com and Software.com. *Phone.com and Software.com Announce Completion of Merger*, News Release, Openwave, Nov. 17, 2000.

⁵¹⁷ See *Fifth Report*, at 17704-17706.

⁵¹⁸ WAP Forum, *The Future of WAP*, Presentation, Feb. 2001 at 3.

⁵¹⁹ *Id.*

⁵²⁰ *WAP-enabled handsets as at October 2000*, MOBILE COMMUNICATIONS INTERNATIONAL, Dec./Jan. 2000/2001, at 99 (Source: EMC).

⁵²¹ *Id.*

⁵²² Peter Rysavy, *WAP: Untangling the Wireless Standard*, NETWORK COMPUTING, Nov. 27, 2000.

⁵²³ *Id.* See Section II.B.3.b, M-Commerce, *infra*.

⁵²⁴ The uncertainty the industry has about WAP is most evident on the cover of the December/January 2000/2001 issue of *Mobile Communications International*, on which the question “On fire or burnt out?” is posed about WAP. See also Peter Rysavy, *E-Commerce Unleashed*, NETWORK COMPUTING, Jan. 22, 2001, available in 2001 WL 9806388 (“*E-Commerce Unleashed*”); Jim Thompson, *WAP- The Technology Everyone Loves to Hate – A Potential Force in Mobile Wireless Access*, BOARDWATCH, Feb. 2001; Peter Rysavy, *WAP: Untangling the Wireless Standard*, NETWORK COMPUTING, Nov. 27, 2000 (“WAP is not a cure-all, and skeptics consider it an interim technology at best.”).

⁵²⁵ Many in the industry have been disappointed with WAP following its commercial introduction in January 2000 in Europe. Some of the disappointment in Europe has been caused by shortages of WAP phones; slow mobile network speeds, and the incompatibility between WAP devices and WAP applications. Mike Hibberd, *How it all*

one of the many available wireless interfaces integrated into mobile phones and will be a necessary step in mobile data evolution.⁵²⁶

b. M-Commerce

M-commerce is the term used for commercial transactions that are conducted via a mobile device, such as a mobile phone or PDA. Consumers currently use a number of m-commerce applications, including financial transactions, ticket purchases, and comparison-shopping.⁵²⁷ For example, Fidelity Investments allows account holders to use mobile devices to complete stock transactions and monitor their investment accounts.⁵²⁸ Also, travel websites such as Expedia.com allow consumers to conduct various m-commerce transactions, including purchasing airplane tickets and making hotel reservations.⁵²⁹

During 2000, it is estimated that businesses and consumers spent \$210 million for m-commerce advertising, applications and transactions.⁵³⁰ While mobile data services are relatively new, analysts believe that there will be strong growth in the number of consumers who will participate in m-commerce⁵³¹ and the revenues generated from the transactions during the next five years.⁵³²

Technological advancements are spurring growth in the number of m-commerce applications. Technological advancements include WAP,⁵³³ Handheld Device Markup Language (“HDML”), Extensible

began, MOBILE COMMUNICATIONS INTERNATIONAL, Dec./Jan. 2000/2001; Matt Hamblen, *WAP Gets Both Jeers, Cheers for Usability*, COMPUTERWORLD, Dec. 18, 2000; Reinhardt Krause, *Does Standard For Wireless Web Pages Have Legs?*, INVESTOR’S BUSINESS DAILY, Sept. 15, 2000; Antony Bruno, *Sky’s the limit for domestic WAP rollout*, RADIO COMMUNICATIONS REPORT, Aug. 21, 2000.

⁵²⁶ The Strategis Group lists three wireless web interfaces: WAP, cHTML, and Microsoft Mobile Explorer. NTT DoCoMo’s iMode service is based on cHTML, and Microsoft’s Mobile Explorer supports both HTML and WAP. 2001 *Strategis Mobile Data Report*, at 12; Jim Thompson, *WAP- The Technology Everyone Loves to Hate – A Potential Force in Mobile Wireless Access*, BOARDWATCH, Feb. 2001; Shyam Kamadalli, *The Yap about WAP*, TELECOMMUNICATIONS, Dec. 1, 2000 (“WAP seems to be a sure bet, at least in the near term.”).

⁵²⁷ *E-Commerce Unleashed*.

⁵²⁸ Fidelity has been offering wireless access to accounts since 1998. Recently, the company began permitting access to 401K accounts via mobile devices. Deborah Bach, *Fidelity Pouncing, Others Still Waiting on Wireless*, AMERICAN BANKER, May 1, 2001, available in 2001 WL 3911224.

⁵²⁹ Karen Kaplan, *M-Commerce Gives Shell-Shocked Web a Glimmer of Light*, LOS ANGELES TIMES, Mar. 12, 2001, available in 2001 WL 2469205.

⁵³⁰ Charles V. Zehren, *Advertisers Set Sights on Wireless Hand-Helds to Target Their Message*, NEWSDAY, Oct. 19, 2000, available in 2000 WL 3722888 (citing the Kelsey Group).

⁵³¹ Herman Mehling, *Anytime, Anywhere E-Commerce Beckons*, VARBUSINESS, Oct. 16, 2000, available in 2000 WL 8236782 (citing IDC).

⁵³² *Welcome to Vodafone Bank, How May We Serve Your Financial Needs*, AMERICAN BANKER, Oct. 17, 2000, available in 2000 WL 25346208 (citing Nortel Networks and the Gartner Group).

⁵³³ See Section II.B.3.a, WAP, *supra*.

Markup Language (“XML”), and Bluetooth.⁵³⁴ HDML and WAP are two of the most prominent tools that are used to enable mobile web browsing.⁵³⁵ XML is increasingly being used in the creation of web sites viewed by consumers on handhelds and mobile phones. Bluetooth is used for wireless communication between electronic devices. These technological advancements enhance the user’s web browsing experience and provide efficient ways to conduct m-commerce transactions. There are several examples of the use of Bluetooth technology to facilitate m-commerce transactions. Bluetooth has been integrated into vending machines in several Nordic countries, including Finland.⁵³⁶ In February 2001, Holiday Inn unveiled its first Bluetooth enabled hotel, which allows automatic room service menu downloads and checkout via a Bluetooth enabled device.⁵³⁷ In addition, companies have committed to developing technology and payment systems to facilitate m-commerce. For example, Yahoo and Visa have developed payment systems to facilitate m-commerce transactions.⁵³⁸

Finally, there are several industry organizations that seek to standardize the architecture and methods used to conduct m-commerce transactions. These organizations include the Global Mobile Commerce Forum, the Mobey Forum, and the Mobile Electronics Transactions Initiative.⁵³⁹

c. Location-Based Services

The Commission’s Enhanced 911 rules (“E911”) provide that starting on October 1, 2001, wireless carriers must begin to phase in automatic location identification (“ALI”) for 911 calls to public safety

⁵³⁴ See Section II.B.3.d, Short Range Data Transmissions, *infra*, for a discussion of Bluetooth.

⁵³⁵ *E-Commerce Unleashed*.

⁵³⁶ Justin Pearse, *European Vending Association Plans Phone-Paid Vending*, NEW MEDIA AGE, March 8, 2001, available in 2001 WL 11317272. The European Vending Association has includes Sonera, Mobilix and Cellpoint. Together the EVA will work to drive m-commerce via vending machines throughout Europe and the United States. *Id.*

⁵³⁷ Bass Hotels, Inc., which owns the Holiday Inn chain, plans to use Bluetooth in all of its properties, including its Crowne Plaza and Intercontinental chains. Leo Lewis, *Room bkd 4u @ Hldy In – CU L8R*, THE INDEPENDENT, Feb. 4, 2001, available in 2001 WL 2792121. In April, Starwood Hotels & Resorts International announced that it would implement m-commerce services for guests using Bluetooth at 120 locations in North America and Europe. *Market Currents*, MBUSINESS, April 1, 2001, available in 2001 WL 20266214.

⁵³⁸ *Yahoo! Launches Two Mobile E-Commerce Services*, News Release, Yahoo, Oct. 19, 2000; *Thyron Teams Up with Visa at Cartes 2000*, M2PRESSWIRE, Oct. 20, 2000, available in 2000 WL 28277241

⁵³⁹ *E-Commerce Unleashed*. Telecommunications operators, Internet content providers, and equipment suppliers founded the Global Mobile Commerce Forum in 1997 to support the development of m-commerce. The Forum is comprised of 48 members including BT Cellnet, Virgin Mobile, InfoSpace, Orange and Motorola (visited Mar. 27, 2001) <<http://www.GMCForum.com>>. The Mobey Forum convened in May 2000 to encourage the use of mobile technology in the financial services sector. The Mobey Forum is comprised of 98 members including ABN-AMBRO Bank, Deutsche Bank, Visa International, Ericsson, Nokia and Siemens (visited Mar. 27, 2001) <<http://www.mobeyforum.org>>. The Mobile Electronics Transaction Initiative was founded in April 2000 by Motorola, Ericsson, and Lucent to create an open industry framework for secure m-commerce transactions (visited Mar. 27, 2001) <<http://www.wideopen.com/computerworld/725.html>>.

answering points (“PSAP”) that have requested it.⁵⁴⁰ In order to comply with this requirement, carriers have two options; they can employ network-based or handset-based location fixing technology.⁵⁴¹ In addition, a third “hybrid” approach, specific to GSM, has been approved for use by VoiceStream in a waiver granted last year.⁵⁴² Most carriers have announced plans to comply with these requirements. For example, Sprint recently announced its plan to employ handset-based triangulation technology that automatically locates the user via wireless assisted GPS technology.⁵⁴³ On the other hand, Verizon Wireless announced it would be implementing a network-based solution and has been conducting field tests of such systems from a number of technology vendors.⁵⁴⁴

In addition to E911 purposes, ALI could potentially be used for a variety of other location-based services such as driving directions, mobile yellow pages, and the location of retailers, restaurants, or movie theaters. Application service providers are currently developing software that will enable a range of location-based services and can be tailored to a customer’s needs based upon their location. For example, AirFlash, Inc. is an application service provider that develops software that plots the location of businesses, hotels and restaurants. The software also allows the user to share the information with others via e-mail.⁵⁴⁵

As the requirement for more precise location information emerges from the Commission’s E911 rules, both industry and the public have begun to contemplate the potential wireless privacy considerations of the misuse of such information. In 1999, Congress adopted the Wireless Communications and Public Safety Act (“911 Act”) to encourage the use of wireless services and to promote public safety by providing protection to users’ location information and specifying the conditions for the release of such information. Specifically, Section 5 of the 911 Act amended Section 222 of the Communications Act that governs carriers’ use or disclosure of customer proprietary network information (“CPNI”). Under the 911 Act, the disclosure or use of wireless location information is further restricted without the “express prior authorization of the customer,” except in specified emergency situations to respond to a wireless user’s emergency call or in the transmission of automatic crash data. On November 22, 2000, the CTIA petitioned the Commission to initiate a rulemaking to implement the 911 Act’s CPNI amendments on wireless privacy. CTIA’s petition requests that rules be adopted to ensure that wireless customers have the

⁵⁴⁰ Under Phase II E911 rules, wireless carriers must provide a PSAP the telephone number of the wireless caller and a precise measurement of the location of the caller, by latitude and longitude. See *Fifth Report*, at 17712-17713.

⁵⁴¹ *Location Based Services: The Next Wave of Wireless Services*, Allied Business Intelligence, Feb. 21, 2001.

⁵⁴² Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, *Fourth Memorandum Opinion and Order*, 15 FCC Rcd 17442 (2000).

⁵⁴³ See Sprint PCS, Revision of the Commission’s Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, *Phase II Implementation Report*, CC Docket No. 94-102, Nov. 9, 2000; *Fifth Report*, at 17712-17713.

⁵⁴⁴ See Verizon Wireless, Revision of the Commission’s Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems, *E911 Phase II Carrier Report*, CC Docket No. 94-102, Nov. 9, 2000; *Verizon Wireless and TruePosition Announce Successful Completion of Location System Test in Manhattan*, News Release, Verizon Wireless, Dec. 19, 2000.

⁵⁴⁵ Joshua L. Kwan, *New Wireless Technology Tracks Location*, KNIGHT RIDDER /TRIBUNE BUSINESS NEWS, Oct. 16, 2000, available in 2000 WL 28272653.

opportunity to provide fully-informed consent to allow the use of their location-based information, while assuring carriers the opportunity to develop new and valuable location-based wireless services. On March 16, 2001, the Commission sought comment on the CTIA petition. By subsequent public notice, the Commission extended the pleading cycle. Reply comments were due by April 24, 2001. The record generated by this pleading cycle is under Commission review.

In September 2000, Ericsson, Motorola, and Nokia founded the Location Interoperability Forum. The Forum's purpose is to define, develop, and promote a common and ubiquitous location services solution.⁵⁴⁶

Companies have also entered into a number of partnerships to develop location-based services. For example, MapInfo, Inc. and Lucent Technologies, Inc. ("Lucent") have partnered to enable wireless carriers to efficiently deliver personalized Internet services based on a customer's current or intended location.⁵⁴⁷ The partners plan to make location-based services available using WAP over GSM networks. Lucent and MapInfo also plan to develop location-based services for next generation technologies.

During 2000, in-vehicle location-based telematics⁵⁴⁸ services became more widespread.⁵⁴⁹ Location-based services first appeared in vehicles as navigational devices using GPS technology to determine the vehicle's location. Many of these devices use a small screen and an extensive database contained on CD-ROM to display maps and directions.⁵⁵⁰ However, OnStar, a wholly owned subsidiary of General Motors, Inc. ("GM") formed in 1996,⁵⁵¹ employs both GPS technology and terrestrial wireless networks. The basic, original OnStar service connects drivers to a live OnStar operator who pinpoints the location of the vehicle and provides verbal driving directions.⁵⁵² OnStar also offer a variety of other in-vehicle communication and location-based, telematics services, including remote access to a vehicle's horn, door locks, and headlights; automatic alerting of public safety officials if an airbag is deployed; roadside assistance; mobile telephone service; and e-mail and Internet access.⁵⁵³ As of January 2001, OnStar was available in 35

⁵⁴⁶ SignalSoft Becomes First Member of Location Interoperability Forum, News Release, SignalSoft, Corp., Oct. 15, 2000.

⁵⁴⁷ *MapInfo/Lucent to Develop Applications for Mobile Internet*, TELEPHONE IP NEWS, Nov. 1, 2000, available in 2000 WL 2145020.

⁵⁴⁸ See Section II.B.4, Telemetry and Telematics, *infra*, for a further discussion of telematics.

⁵⁴⁹ Steve Ditlea, *Wheels Online*, MC TECHNOLOGY MARKETING INTELLIGENCE, March 1, 2001, available in 2001 WL 15717085.

⁵⁵⁰ The CD-ROM dependent location based devices require drivers to program the destination into an in-dash console while the vehicle is stopped, in order to avoid distraction. These location based devices are available for \$1,500 to \$2,000, including installation. Cade Metz, *Nokia Gets Behind the Wheel*, PC MAGAZINE, March 12, 2001, available in 2001 WL 4945975; G. Chambers Williams III, *Global Positioning System Guides Drivers Now*, SAN ANTONIO EXPRESS NEWS, March 25, 2001, available in 2001 WL 17167238.

⁵⁵¹ The number of subscribers includes the owners of GM's high-end models who receive the service free for one year whether they use it or not. The OnStar system connects to a live OnStar operator who can pinpoint the location of the vehicle and provide verbal driving instructions. Steve Ditlea, *Wheels Online*, MC TECHNOLOGY MARKETING INTELLIGENCE, March 1, 2001, available in 2001 WL 15717085.

⁵⁵² Steve Ditlea, *Wheels Online*, MC TECHNOLOGY MARKETING INTELLIGENCE, March 1, 2001, available in 2001 WL 15717085.

⁵⁵³ There are two OnStar service plans: the Safety & Security Plan and the Premium Plan. The Safety & Security Plan offers live connection to an OnStar operator, remote access to the vehicle's horn, door locks and

vehicle models and had nearly 820,000 subscribers.⁵⁵⁴

In addition to GM's OnStar, Harman International manufactures a similar location-based system for BMW's 7 series and for various Porsche and Audi models, which includes a touch-screen and mouse used to control satellite-based navigation services, mobile telephone service, and e-mail and Internet access.⁵⁵⁵ Furthermore, a service similar to OnStar, called Tele-Aid, is currently offered in a few Mercedes-Benz models, including the ML series sport utility vehicles.⁵⁵⁶

d. Short Range Data Transmissions

Short-range data transmission is device-to-device communication over short distances. Infrared, a well-established technology, is currently used in some PDAs to allow users to transfer data between two devices. Infrared is also the technology commonly used in remote controls and it requires line-of-sight transmission. Another technology used for short-range data transmissions is Bluetooth, which will enable multipoint, broadcasting applications.

Bluetooth is a technology used to establish wireless connectivity between electronic devices that are up to 10 meters apart.⁵⁵⁷ Bluetooth allows users to send signals and transfer data among numerous electronic devices, thus creating a personal area network ("PAN").⁵⁵⁸ Bluetooth uses unlicensed spectrum in the 2.4

headlights, and public safety officials if the airbag deploys. This plan costs \$16.95 per month. The Premium Plan allows subscribers to pre-purchase voice and data minutes from Verizon Wireless. Each vehicle that is equipped with the Premium service has its own phone number for incoming and outgoing calls. In addition, the Premium Plan allows subscribers to use voice commands to access e-mail and Internet content, such as news, stock quotes, sports scores and weather reports. This plan costs \$34.95 per month. Steve Ditlea, *Wheels Online*, MC TECHNOLOGY MARKETING INTELLIGENCE, March 1, 2001, available in 2001 WL 15717085. OnStar has also partnered with Fidelity Investments to offer in-vehicle access to stock trading and investment accounts with the Premium Plan. Beth Healy, *GM's OnStar Service Offers Hands-Free Market Data*, BOSTON GLOBE, Feb. 25, 2001, available in 2001 WL 9341166.

⁵⁵⁴ The number of subscribers includes the owners of GM's high-end models who receive the service free for one year whether they use it or not. Steve Ditlea, *Wheels Online*, MC TECHNOLOGY MARKETING INTELLIGENCE, March 1, 2001, available in 2001 WL 15717085.

⁵⁵⁵ Harman International's system, called Becker Online Pro, is currently being sold in Europe in the BMW 7-series models. A similar system is scheduled to appear in the United States in the 2002 BMW 7-series, Porsche and Audi models. Jerry Knight, *Harman Fine Tuning A 'Telematics' Plan*, THE WASHINGTON POST, March 8, 2001, available in 2001 WL 2549423.

⁵⁵⁶ Mercedes-Benz plans to make the TeleAid system available in its 2002 models. The annual subscription rate for Tele-Aid is \$125.00. Jim Mateja, *Variety is Standard on Mercedes SUVs*, SOUTH FLORIDA SUN-SENTINEL, Feb. 23, 2001, available in 2001 WL 2661136.

⁵⁵⁷ The name Bluetooth comes from the Danish King Harald Blatand II who peacefully unified Denmark and Norway. The range of Bluetooth-enabled devices may be extended to 100 meters with additional amplifiers. Bluetooth Special Interest Group, *FAQ: Bluetooth Trademark* (visited Oct. 25, 2000) <<http://www.bluetooth.com/bluetoothguide/faq/8.asp>>.

⁵⁵⁸ Personal Area Network ("PAN") is a term being used to describe the network that is created when wireless devices are connected in a small office or home environment. Motorola, *Motorola Bluetooth [Personal Area Networks]* (visited Feb. 12, 2001) <<http://www.motorola.com/bluetooth/pan/pan.html>>; Compaq, *Wireless personal area network* (visited Feb. 12, 2001) <<http://www5.compaq.com/products/wireless/wpan>>.

GHz band and transmits data at speeds close to 1 Mbps. Bluetooth also uses frequency hopping spread spectrum techniques to provide enhanced communications performance and an initial level of transmission security.⁵⁵⁹

As mentioned in the *Fifth Report*, Bluetooth is widely backed by major players in the wireless industry, including Ericsson, Intel Corp., International Business Machines Corp. (“IBM”), Nokia, Toshiba, 3Com Corp., Lucent, Microsoft, and Motorola.⁵⁶⁰ As a result of industry cooperation, analysts forecast a large market for Bluetooth products. For example, Cahners In-Stat Group estimates there will be 1.4 billion Bluetooth-enabled products by 2005.⁵⁶¹ ING Barings expects Bluetooth chips to generate \$3 billion in revenues by 2003.⁵⁶²

Bluetooth-enabled chips for laptops, desktop PCs, and mobile phones were the first products to be made available in 2000.⁵⁶³ Analysts expect Bluetooth-enabled products to hit the market *en masse* in late 2001.⁵⁶⁴ As of December 2000, chips cost about \$20 each.⁵⁶⁵ However, analysts believe that chip prices will likely decrease to \$5, which will increase the viability of Bluetooth-enabled devices.⁵⁶⁶

Another wireless networking technology sharing the 2.4 GHz frequency band with Bluetooth is the Institute

⁵⁵⁹ The Bluetooth standard calls for frequency hopping, spread-spectrum techniques that make 1,600 hops per second among different frequencies within the 2.4 GHz ISM band. On its website, the Bluetooth SIG mentions that two other security features available are encryption and authentication. Both features may be employed on an application level. Bluetooth Special Interest Group, *FAQ – Security* (visited Oct. 25, 2000) <<http://www.bluetooth.com/bluetoothguide/faq/5.asp>>; Art Wittmann, *Brush Up on Bluetooth*, NETWORK COMPUTING, June 28, 1999, available in 1999 WL 8445722.

⁵⁶⁰ See *Fifth Report*, at 17706. Bluetooth has been under development since 1994 when Ericsson began conducting a feasibility study. In 1998, the Bluetooth Special Interest Group (SIG) was formed. The group, which promotes the Bluetooth standard, has over 2,000 adopter companies.

⁵⁶¹ Cahners In-Stat Group, selected data from “Bluetooth 2000: To Enable the Star Trek Generation,” <<http://www.instat.com>>; Cathleen Moore, *Bluetooth-enabled products finally hit market*, INFOWORLD, Dec. 18, 2000, available in 2000 WL 26552351.

⁵⁶² Liz Vaughan-Adams, *Giving Bluetooth a little extra bite*, THE INDEPENDENT, Feb. 21, 2001, available in 2001 WL 2796148.

⁵⁶³ See Appendix D, Table 10, at D-12.

⁵⁶⁴ Sarah L. Robers-Witt, *Will Bluetooth Bite Soon?*, PC MAGAZINE, Jan. 1, 2001, available in 2001 WL 4945284. For a list of products available at the end of 2000 and those slated to begin selling in 2001, see Appendix D, Table 10, at D-12.

⁵⁶⁵ Survey, *Is Bluetooth worth the wait?*, THE ECONOMIST, Dec. 9, 2000, available in 2000 WL 8144813; Dan Meyer, *Bluetooth At The Gate; Ready To Run: SIG Works Through Testing Issues, Standards Setting And Early Hype*, RCR RADIO COMMUNICATIONS REPORT, Sept. 25, 2000, available in 2000 WL 26131159.

⁵⁶⁶ Dan Meyer, *Bluetooth At The Gate; Ready To Run: SIG Works Through Testing Issues, Standards Setting And Early Hype*, RCR RADIO COMMUNICATIONS REPORT, Sept. 25, 2000, available in 2000 WL 26131159; *Bluetooth Gaining Speed, But Obstacles Remain*, CT WIRELESS, Volume 4 Issue 185, Sept. 26, 2000, available in 2000 WL 6392471.

of Electrical and Electronics Engineers⁵⁶⁷ (“IEEE”) 802.11b standard, also called wireless fidelity (“WiFi”). The 802.11b standard is used in devices to connect to wireless local area networks (“WLANs”), and allows a maximum throughput of 11 Mbps.⁵⁶⁸ The technology is being implemented by a number of vendors in public places such as airports, hotels and Starbucks stores⁵⁶⁹ to allow users wireless access via 802.11b-enabled notebook computers, handheld devices, smartphones and pocket PCs. In addition, the 802.11b standard is being integrated into many products, including notebook computers, desktop PCs and handheld devices. For example, Apple Computer, Inc. (“Apple”) introduced AirPort in July 1999 for use in schools and homes.⁵⁷⁰ AirPort, which is designed to work with Apple’s desktop and laptop computers, uses the 802.11b standard to allow multiple users to share an Internet connection wirelessly.⁵⁷¹ HomeRF, developed by the Home Radio Frequency Working Group,⁵⁷² also operates in the 2.4 GHz frequency band, using a combination of data networking technologies derived in part from the 802.11b standard, and cordless phone technologies adapted from DECT.⁵⁷³

Unlicensed spectrum is also used to provide fixed wireless high-speed Internet access to homes and businesses in neighborhoods and communities across the United States. See Appendix A, *infra*, for a discussion of these services.

Analysts have made several predictions about the growth of the wireless LAN market and 802.11b. Frost & Sullivan predicts that wireless LAN industry revenues will reach \$884 million by 2002, compared to \$415 million in revenues forecast in 1999.⁵⁷⁴ Cahners In-Stat Group expects that more than 10 million 802.11b products will be installed by the end of 2001,⁵⁷⁵ and Gartner Group estimates 95 percent of

⁵⁶⁷ The Institute of Electrical and Electronics Engineers (“IEEE”) is a technical society that sponsors conferences, publishes technical papers, and provides a forum for the development of standards. IEEE standards include those for computers and telecommunications, specifically standards used for LANs such as 802.11b. Harry Newton, *Newton’s Telecom Dictionary*, 1998, at 358.

⁵⁶⁸ J. William Gurley, *The next big thing? Try 802.11b*, CNET.COM, Feb. 19, 2001; Curtis Franklin, *Cut The Cord*, INTERNETWEEK, Mar. 12, 2001, available in 2001 WL 8007251; Terry Sweeney, *802.11B: One Standard Worth Waiting For*, TECHWEBUK.COM, Nov. 16, 2000.

⁵⁶⁹ John C. Dvorak, *Wireless Whale*, FORBES, Mar. 5, 2001, available in 2001 WL 2184050; Michael Dell *Puts Wireless in Focus; Sees Standards, Notebooks as Easy Way for Customers to be Connected*, BUSINESS WIRE, Mar. 20, 2001. In January 2001, Starbucks announced it will begin installing MobileStar Network Corporation’s wireless broadband network in stores, allowing customers with 802.11b-enabled notebook computers, handheld devices, smartphones and pocket PCs to access broadband content and services in Starbucks stores. *Starbucks and Microsoft Blend Coffee Retailer’s Expertise With Technology Leader’s Software and Services to Deliver Wireless Cof*, News Release, Starbucks, Jan. 3, 2001.

⁵⁷⁰ *Apple Introduces AirPort Wireless Networking*, News Release, Apple, Jul. 21, 1999

⁵⁷¹ AirPort works with Apple’s iBook, iMac, PowerBook G4, Power Mac G4 Cube and Power Mac G4. Apple, *Apple – AirPort* (visited May 21, 2001) <<http://www.apple.com/airport/>>.

⁵⁷² Members include Siemens, Compaq, Motorola, National Semiconductor, and Proxim. HomeRF, *Frequently Asked Questions* (visited June 18, 2001) <http://www.homerf.org/about/faq_general.html>.

⁵⁷³ *Id.* DECT is the Digitally Enhanced Cordless Telephone standard that is widely used across Europe. *Id.*

⁵⁷⁴ Wireless Ethernet Compatibility Alliance, *Wi-Fi Value and the Benefit of Standards* (visited Apr. 30, 2001) <<http://www.wi-fi.org/benefitsfaq.asp>>.

notebook computers will be 802.11b-enabled by 2005.⁵⁷⁶

On May 11, 2001, the Commission released a Further Notice of Proposed Rulemaking and Order, amending Part 15 of the Commission's rules for spread spectrum devices. The Commission proposes the following changes to systems operating in the 2.4 GHz band: to revise rules for frequency hopping spread spectrum systems; to eliminate the processing gain for direct sequence spread spectrum systems; and to allow digital transmission technologies to operate pursuant to the same rules as spread spectrum systems.⁵⁷⁷

4. Telemetry and Telematics

Telemetry and telematics both involve the use of wireless technology to transfer data between systems and devices. Wireless telemetry is the monitoring of mobile or fixed equipment in a remote location. The most common example of wireless telemetry is the remote monitoring of utility meters by utility and energy companies, called automatic meter reading ("AMR"). With telematics systems, a person in a remote location can access information using various wireless technologies. Telematics is most often used to describe vehicle navigation systems, such as OnStar, where drivers and passengers employ GPS technology to obtain directions, track their location, and obtain assistance when a vehicle is in an accident. These systems were discussed in more detail above in the Location-Based Services Section of this report.⁵⁷⁸

In addition to AMR, wireless telemetry systems can also be used to monitor health care equipment, HVAC systems, gas and oil pipelines, vending machines, alarm systems, parking meters, streetlights, smoke/fire detectors, factory process systems, and photocopiers. Moreover, companies can employ wireless telemetry to remotely monitor the location and status of vehicles. A few examples of this include LoJack, corporate fleet tracking, and remote engine diagnostic systems. LoJack is a system used to recover stolen vehicles. Consumers can purchase the LoJack VHF transponder unit for their vehicles, and the LoJack Corporation and law enforcement agencies maintain the system used to track the location of vehicles in the case that they are stolen.⁵⁷⁹ Over 40,000 stolen vehicles equipped with LoJack have been recovered by U.S. law enforcement agencies.⁵⁸⁰

The two major AMR providers are Schlumberger Resource Management Services, Inc. ("Schlumberger") and Itron, Inc. ("Itron").⁵⁸¹ As mentioned in the *Fifth Report*, Schlumberger completed its acquisition of CellNet Data Systems in May 2000⁵⁸² and, since that time, has continued to use CellNet as the brand name

⁵⁷⁵ Toni Kistner, *Small businesses warming to 802.11b*, NETWORK WORLD, Apr. 23, 2001.

⁵⁷⁶ J. William Gurley, *The next big thing? Try 802.11b*, CNET.COM, Feb. 19, 2001.

⁵⁷⁷ Amendment of Part 15 of the Commission's Rules Regarding Spread Spectrum Devices and Wi-LAN, Inc. Application for Certification of an Intentional Radiator Under Part 15 of The Commission's Rules, *Further Notice of Proposed Rulemaking And Order*, DA 00-2317 (rel. May 11, 2001).

⁵⁷⁸ See Section II.B.3.c, Location-Based Services, *supra*.

⁵⁷⁹ LoJack Corporation, SEC Form 10-K/A, Mar. 13, 2000.

⁵⁸⁰ LoJack Corporation, *Company Overview* (visited May 25, 2001) <<http://www.lojack.com/about/index.htm>>.

⁵⁸¹ See Appendix D, Table 11, at D-13 for an overview of their services.

⁵⁸² See *Fifth Report*, at 17726.

for its wireless telemetry services in North America. In February 2001, Schlumberger announced that it had connected five million consumers to its CellNet wireless telemetry network,⁵⁸³ a 67 percent increase over the three million units CellNet had connected at the end of 1999.⁵⁸⁴ Schlumberger also had contracts to connect an additional three million consumers to its network.⁵⁸⁵ During 2000, Schlumberger acquired an exclusive license to use and sell Metricom's UtiliNet RF technology.⁵⁸⁶ Itron focuses exclusively on providing AMR telemetry equipment and is the largest provider in that market. As of the end of 2000, Itron had connected over 17 million AMR units, a 10 percent increase from the previous year, for 650 utility companies.⁵⁸⁷

Many mobile data providers discussed above, including WebLink, SkyTel, Motient, and Cingular Interactive, offer a variety of telemetry services, either directly to end users or through other telemetry providers who create and maintain telemetry computers systems for end users but rely on the networks of mobile data providers.⁵⁸⁸ As mentioned in the *Fifth Report*, many analysts and industry players believe that the telemetry market represents a significant business opportunity for paging/messaging carriers.⁵⁸⁹ In addition, two companies, Aeris.net ("Aeris") and Cellemetry, lease capacity on mobile telephone networks to offer telemetry products. Aeris sells the use of its network to other telemetry service providers. During 2000, Aeris signed several contracts⁵⁹⁰ with telemetry providers who offer services such as AMR, mobile asset tracking, and the monitoring of petrochemical assets, tanks, and generators.⁵⁹¹

⁵⁸³ Schlumberger RMS Reaches Major Milestone, Connects 5 Millionth Consumer to Wireless Fixed Network, News Release, Schlumberger, Feb. 26, 2001.

⁵⁸⁴ CellNet Installs Three Millionth Device into Wireless Network, NETWORKS UPDATE, Dec. 1, 1999, available in 1999 WL 11391122.

⁵⁸⁵ Schlumberger RMS Reaches Major Milestone, Connects 5 Millionth Consumer to Wireless Fixed Network, News Release, Schlumberger, Feb. 26, 2001.

⁵⁸⁶ Schlumberger Ltd, SEC Form 10-Q, May 12, 2000.

⁵⁸⁷ Itron, Inc. Expresses Confidence in Fourth Quarter Guidance; Reports Strong Fourth Quarter Bookings, News Release, Itron, Dec. 22, 2000; Itron and eMobile Data Sign Exclusive Development, License and Distribution Agreements, News Release, Itron, Feb. 6, 2001.

⁵⁸⁸ See Appendix D, Table 11, at D-13 for the details on the services offered by these carriers.

⁵⁸⁹ See *Fifth Report*, at 17727.

⁵⁹⁰ See Appendix D, Table 11, at D-13 for details on these contracts.

⁵⁹¹ Telemetry Technologies To Deploy Aeris.Net's Microburst™ Technology, News Release, Aeris, May 19, 2000.

III. CONCLUSION

The past year has continued the positive trends of increased competition in the CMRS industry described in the *Fifth Report*. First, during 2000 mobile telephone subscribership climbed 23.5 million, to 109.5 million. That represents a 28 percent increase over a year earlier and is the largest twelve-month increase in total number of subscribers in the history of the sector, surpassing even 1999's record breaking 16.9 million additional subscribers. This subscriber growth brought the U.S. wireless penetration rate to 39 percent. In addition, other key metrics demonstrate the increased demand for and reliance placed on mobile services. During 2000, average MOUs increased by 32 percent and ARPU increased 10 percent, while, according to the Bureau of Labor Statistics, the price of mobile telephone service fell by 12.3 percent.

Second, the deployment and acceptance of digital technology continued unabated, with 95 percent of the total U.S. population living in counties where operators offer digital mobile telephone service and 62 of all mobile telephone subscribers using digital phones at the end of 2000.⁵⁹² The widespread adoption of digital technology is not only increasing spectral efficiency and lowering network costs, but causing a convergence between cellular and PCS.

Third, mobile telephony providers continued to expand their nationwide footprints and buildout their networks. To date, 259 million people, or 91 percent of the total U.S. population, have three or more different operators offering mobile telephone service in the counties in which they live. Over 214 million people, or 75 percent of the U.S. population, live in areas with five or more mobile telephone operators competing to offer service. And 133 million people, or almost 47 percent of the population, can choose from among six or more different mobile telephone operators.

Fourth, competition has been instrumental in shaping the mobile data sector. A variety of mobile data services, ranging from paging to e-mail to web access to SMS, are currently available on a variety of devices from numerous providers, including mobile telephone operators, paging/messaging carriers, handheld PDA device providers, and dedicated data network operators. The six nationwide mobile telephone carriers currently offer mobile Internet access services and had at least 2.5 million mobile Internet users as of the end of 2000.⁵⁹³ Paging/messaging operators, who face intense competition from each other as well as other mobile data providers, have continued to diversify their services by offering their customers a variety of advanced messaging and Internet-based services. In addition to mobile telephone and paging/messaging carriers, increased competition in the mobile data sector has come from handheld devices with wireless Internet connections, as well as the mobile data services offered by dedicated data network operators.

The evolution of mobile data services and technologies is proceeding rapidly. Mobile telephone carriers are planning to deploy 3G technologies over the next few years in order to offer mobile Internet access at higher speeds, ultimately up to 2 Mbps. At least six major carriers currently plan to roll out technologies during 2001 that will allow them to increase data transfer speeds from 9.6 to 19.2 kbps to up to 144 kbps. A number of mobile data technologies and services, including WAP, Bluetooth, location-based services, and m-commerce, are currently being developed and will likely facilitate growth in the mobile data industry as it evolves.

⁵⁹² See Section II.A.1.c, Continued Rise of Digital, *supra*.

⁵⁹³ See Section II.B.2.a, Paging/Messaging, *supra*.

Finally, mobile services are changing the way Americans communicate. Initially a business tool, mobile phones have become a mass-market consumer device. One survey found that the overwhelming majority of mobile telephone customers use their phones primarily for personal calls.⁵⁹⁴ And for some, particularly younger Americans, wireless service is no longer a compliment to wireline service, but has become the preferred method of communication.

IV. ADMINISTRATIVE MATTERS

This Sixth Report is issued pursuant to authority contained in Section 332 (c)(1)(C) of the Communications Act of 1934, as amended, 47 U.S.C. § 322 (c)(1)(C).

It is ORDERED that the Secretary shall send copies of this Report to the appropriate committees and subcommittees of the United States House of Representatives and the United States Senate.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas
Secretary

⁵⁹⁴ See Section II.A.1.e, Wireless/Wireline Competition, *supra*.

APPENDIX A: FIXED WIRELESS VOICE AND DATA SERVICES

I. INTRODUCTION

In this section, the Commission reviews the state of competition provided by fixed wireless⁵⁹⁵ operators for voice and data services in both residential and business markets. While some spectrum traditionally used for CMRS is also being used for fixed wireless service,⁵⁹⁶ other spectrum bands, including Multipoint Distribution Service (“MDS”), Wireless Communications Service (“WCS”), unlicensed spectrum bands, 24 GHz, Local Multipoint Distribution Service (“LMDS”), and 39 GHz, are also being used to provide such service. For discussion purposes, operators are divided into two categories: lowerband providers (800 MHz to 5.8 GHz) and upperband providers (24 GHz to 39 GHz).

A. Fixed Wireless Access

In a fixed wireless access system, a provider attaches a radio transmitter to a customer’s premises that communicates with the provider’s central antenna site. This antenna site acts as the gateway to the PSTN or the Internet. This technology functions as a replacement for the “last mile” of copper wire that has traditionally provided individual customers with telecommunications services, thus allowing a wireless provider to compete with a traditional wireline service provider. The “last mile” is also referred to as the “local loop”; thus, fixed wireless access is often referred to as “Wireless Local Loop,” or “WLL” for short.

WLLs afford fixed wireless competitors direct access to an individual customer’s building, thereby lessening their reliance on the facilities of local exchange carriers (“LECs”). In addition to providing new competition in existing markets, fixed wireless systems can provide new services and expand capacity into areas considered too expensive to serve with available wireline technologies. Fixed wireless technology can provide broadband, or high-speed, services faster and for less money than wireline technologies. The Commission has used the term “broadband services” to refer to a larger set of services that end users can access with asymmetric capabilities and speeds that are less than 200 kbps, but are generally considered high-speed (*i.e.*, greater than 128 kbps in a wireless environment or 144 kbps in a wireline environment).⁵⁹⁷

Lower Network Deployment Costs. Fixed wireless operators claim that their networks have a significantly

⁵⁹⁵ “Fixed wireless” services are also sometimes referred to as “wireless broadband” or “wireless DSL.” The Commission endeavors to make its information as up-to-date as possible, and, unless otherwise noted, the data in this section of the report covers the period through May 2001. Because the fixed wireless sector changes so rapidly, some of the information may not be current as you are reading it.

⁵⁹⁶ “Licensees of cellular systems may use alternative cellular technologies and/or provide fixed services on a co-primary basis with their mobile offerings, including personal communications services . . . on the spectrum within their assigned channel block.” 47 CFR § 22.902(d).

⁵⁹⁷ In contrast, in its first report on the deployment of advanced telecommunication services, the Commission defined “advanced telecommunications capability” as upstream and downstream communications paths “having the capability of supporting . . . a speed . . . in excess of 200 kilobits per second (kbps) in the last mile.” Inquiry Concerning The Deployment Of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, *Report*, 14 FCC Rcd 2398, 2406, at ¶ 20 (1999). *See also*, Local Competition and Broadband Reporting, *Report and Order*, 15 FCC Rcd 7717, 7720, at note 8 (2000).

lower cost structure than wireline systems for two primary reasons.⁵⁹⁸ First, wireless networks are free of many of the installation and maintenance costs incurred with wiring a customer's building to a central office. Second, unlike a wireline network, in which an entire market must be wired before initiating service, a wireless network can be deployed incrementally as more customers are added. Therefore, the capital expenditures of a fixed wireless network are much lower.

Underserved Markets. In general, penetration by existing high-speed wireline systems is relatively low. For example, only a small percentage of office buildings have access to fiber optic lines.⁵⁹⁹ Therefore, many businesses with volume too low for expensive fiber connections are potential customers for fixed wireless carriers.⁶⁰⁰ In addition, fixed wireless access has the potential to provide broadband services to residential customers in both urban and rural markets, including those without access to broadband services through cable modems or DSL.⁶⁰¹ Moreover, fixed wireless can be an efficient means of providing basic telephone and data services to isolated areas and other market segments that are not currently reached by traditional telephone networks.

B. Comparison of Lower and Upper Bands

As mentioned above, fixed wireless operators use several different spectrum bands to provide voice and data services. These bands are grouped into two categories – lowerbands and upperbands – because of their similar technical characteristics and use by carriers. The lowerbands consist of the cellular (800 MHz) and broadband PCS (1900 MHz) bands, the MDS (2.5-2.7 GHz) band, the WCS (2.3 GHz) band, and the unlicensed bands. The upperbands consist of the 24 GHz (DEMS) band, the LMDS (28 GHz) band, and the 39 GHz band.

The lowerbands can serve a wider geographic area with a single transmitter than the upperbands (see Figure 1 below). Lowerbands have a service radius of five to 35 miles from a central hub, depending on the particular band, the power of the transmitter, and the terrain. Upperband operators, on the other hand, face significant losses of signal strength due to atmospheric conditions, most notably precipitation (*i.e.*,

⁵⁹⁸ See *Fifth Report*, at 17785.

⁵⁹⁹ Estimates of this market vary. Teligent estimates 3 to 4 percent of the office buildings in the United States are wired through fiber; however, these buildings account for 30 percent of business phone lines. Stan Draenos, *Wireless Goes the Last Mile*, UPSIDE TODAY, Oct. 9, 2000, available in 2000 WL 4725953 (quoting Bruce Wagner, Senior VP for field operations at Teligent). The Strategis Group estimates 4 percent of all buildings in the United States are connected by fiber. See Arielle Emmett, *Alcatel's LMDS Strategy: "Scars, Welts and Staying Power,"* BROADBAND WIRELESS BUSINESS, Mar. 2001, at 32. McKinsey & Company and J.P. Morgan Securities estimate that 5 percent of large U.S. buildings are of sufficient size and relative proximity to be targeted by fiber. *Broadband 2001*, McKinsey & Company and J.P. Morgan Securities, 2001.

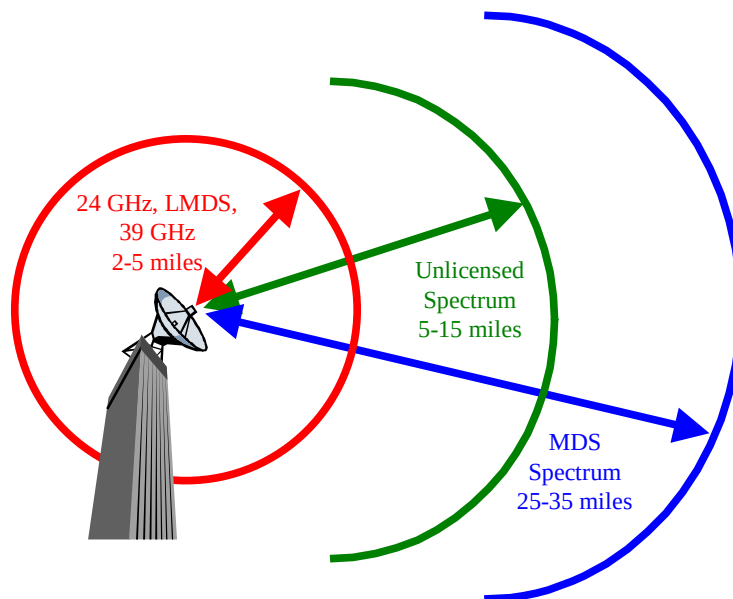
⁶⁰⁰ Robertson Stephens estimates that there are 8 million small and medium-sized businesses in the United States. Jim Friedland and Amy Roth, *Broadband Wireless Access: Beyond the Reach of Fiber*, Robertson Stephens Telecom Services Research, Feb. 18, 2000, at 1. Lehman Brothers estimates that mid-sized businesses use 25 to 35 million access lines. Tim Luke, *Introducing the Broadband Wireless Equipment Market*, Lehman Brothers, Aug. 5, 1999, at 6.

⁶⁰¹ Inquiry Concerning The Deployment Of Advanced Telecommunications Capability To All Americans In A Reasonable And Timely Fashion, And Possible Steps To Accelerate Such Deployment Pursuant To Section 706 Of The Telecommunications Act Of 1996, *Report*, 14 FCC Rcd 2398, 2422 (2000).

rain, snow, and fog).⁶⁰² Therefore, the range of individual transmitters in the upperbands is approximately two to five miles.

With the exception of carriers that use PCS spectrum,⁶⁰³ both upper and lower band operators currently require a clear line-of-sight between their transmitters and their customers' receivers. However, recent technological developments may help to overcome this line-of-sight restriction. For example, Orthogonal Frequency Division Multiplexing ("OFDM") is a technology standard currently being developed for use in multiple wireless products, including wireless LANs, mobile wireless systems, and broadband fixed wireless access.⁶⁰⁴ OFDM has the potential to overcome the line-of-sight restriction that fixed wireless operators face by redirecting signals as they bounce off buildings and other objects.⁶⁰⁵ OFDM is also expected to increase the speeds of wireless networks.⁶⁰⁶ Fixed wireless equipment vendors, such as Cisco

Figure 1. Fixed Wireless Coverage Radii



Systems, NextNet Wireless, and Hybrid Networks, Inc. ("Hybrid Networks"), are developing non-line-of-

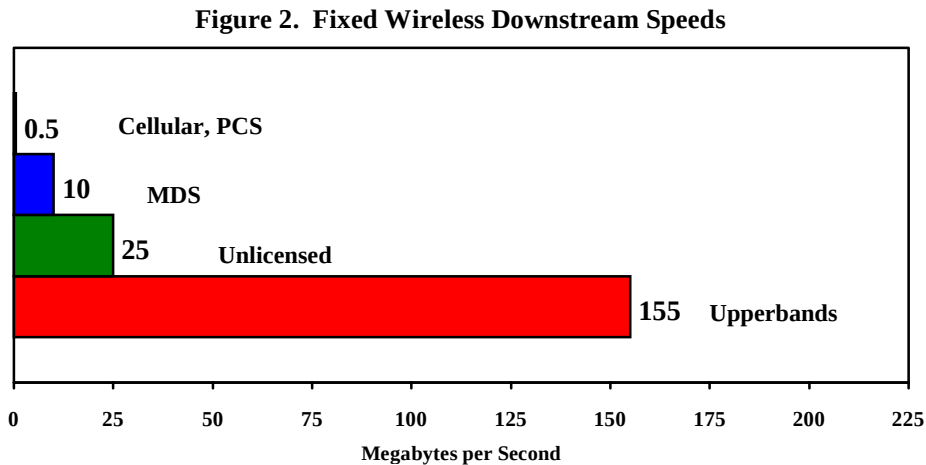
⁶⁰² However, by adjusting factors such as cell size and transmission power, the networks can be engineered to the standard level of reliability in a telecommunications network, 99.999 percent. This level of reliability is also known as "five 9's."

⁶⁰³ Gerry Blackwell, *Project Angel: Very Much Alive and Kicking*, BROADBAND WIRELESS BUSINESS, Mar. 2001, at 44 ("Blackwell Project Angel Article")

⁶⁰⁴ Steve Stroh, *OFDM Forum Grinds On With Mission*, BROADBAND WIRELESS BUSINESS, Jan. 2001, at 8 ("Stroh OFDM Article"); Jim Grier, *Enabling Fast Networks with OFDM*, COMMUNICATION SYSTEMS DESIGN, Feb. 1, 2001, <<http://www.csdmag.com/story/OEG20010122S0078>>. OFDM is sometimes referred to as multi-carrier or discrete multi-tone modulation. See Jim Grier, *Enabling Fast Networks with OFDM*, COMMUNICATION SYSTEMS DESIGN, Feb. 1, 2001, <<http://www.csdmag.com/story/OEG20010122S0078>>.

⁶⁰⁵ *Stroh OFDM Article*; See *Fifth Report*, at 17793.

⁶⁰⁶ *Stroh OFDM Article*; Jim Grier, *Enabling Fast Networks with OFDM*, COMMUNICATION SYSTEMS DESIGN, Feb. 1, 2001, available at <<http://www.csdmag.com/story/OEG20010122S0078>>.



sight products for fixed wireless carriers,⁶⁰⁷ and AT&T currently uses OFDM technology in its fixed wireless service, as discussed below.⁶⁰⁸

Upperband operators can transfer data at much higher speeds than lowerband operators because upperband operators have much larger spectrum allocations. The highest reported speed offered by a lowerband carrier is around 25 Mbps, versus 155 Mbps for upperband providers (see Figure 2).

The lower and upperband operators generally serve two distinct markets. Like many wireline competitive local exchange carriers (“CLECs”), upperband operators sell very high-speed broadband and data services, as well as local and long distance voice services, to business customers, mainly in urban areas. Moreover, many upperband carriers use wireline fiber networks in conjunction with their fixed wireless technology. Lowerband operators, on the other hand, generally offer high-speed Internet access at around 1.5 Mbps to residential and small office/home office (“SOHO”) customers in a range of geographic areas that includes rural and underserved areas.⁶⁰⁹ One analyst estimated that at the end of 2000 there were 230,000 total fixed wireless subscribers in the upper and lower bands, including 80,000 residential customers.⁶¹⁰

Both upperband and lowerband carriers use multiple spectrum bands to offer identical services. For example, AT&T uses both PCS and WCS spectrum for its Digital Broadband product.⁶¹¹ And Winstar Communications, Inc. (“Winstar”) has used both 39 GHz and LMDS spectrum to offer its package of voice and broadband services.

⁶⁰⁷ See Fifth Report, at 17793; *Hybrid Networks to Develop Non-Line-of-Sight Wireless Broadband Router*, BROADBAND WIRELESS BUSINESS, Jan. 2001, at 9.

⁶⁰⁸ *Blackwell Project Angel Article*. See Section II.D, Major Lowerband Operators, *infra*, for a discussion of AT&T’s Digital Broadband service.

⁶⁰⁹ See Section II.D, Major Lowerband Operators, *infra*. See also Appendix E, Map 7, p. E-8.

⁶¹⁰ Elizabeth Douglas, *Putting Broadband on the Air Wireless Technology is Speeding the Spread of Residential Service*, LOS ANGELES TIMES, Oct. 19, 2000, available in 2000 WL 25909045 (quoting Brian Gilman, senior analyst at eMarketer Inc.) (“*Douglas Broadband Article*”); Joan Van Tassel, *Fixed Wireless Coming Despite AT&T Restructuring*, LOS ANGELES BUSINESS JOURNAL, Nov. 6, 2000, available in 2000 WL 27194905 (quoting eMarketer).

⁶¹¹ See Section II.D, Major Lowerband Operators, *infra*.

Most fixed wireless carriers use either point-to-point (“PTP”) or point-to-multipoint (“PTMP”) transmission technologies, or a mix of the two, in their systems. In a PTP network, at the hub,⁶¹² there is a single transmitting dish for each customer on the network. In a PTMP network, multiple customers can be serviced by a single specialized transmitter at the hub. PTMP has a number of advantages over PTP.⁶¹³ PTMP allows for the cost of the hub site antenna to be allocated over numerous customer building sites, rather than just one, and reduces the capital expenditures necessary to bring service to a particular building.⁶¹⁴ In addition, the use of PTMP allows fixed wireless operators to allocate and share network capacity on an as-needed basis and supply customers with bandwidth-on-demand to address their dynamic capacity needs.⁶¹⁵

II. LOWERBANDS

A. Introduction

The following spectrum bands below 6 GHz are used to offer commercial fixed wireless services: Cellular/PCS, MDS, WCS, and Unlicensed. In previous CMRS Reports, these bands and the operators that use them were discussed separately. However, because these bands have similar technical characteristics, because they are used to offer similar services, and because many lowerband operators employ more than one of these bands to offer these services, they are now discussed in one cohesive lowerbands section. Yet, in order to provide background on these four bands before discussing trends and individual lowerband operators, a brief description of each band follows.

Cellular/PCS: In the United States, WLL in the cellular and broadband PCS bands is still in an early stage of development, is currently targeted at residential subscribers, and is secondary to the use of the spectrum for mobile products. AT&T is currently the only carrier to use PCS spectrum to offer high-speed Internet access.⁶¹⁶ A handful of other operators are using their existing cellular or PCS infrastructure to offer fixed wireless voice services, but none offers those services at higher speeds.⁶¹⁷ In order to receive universal

⁶¹² A hub is the point on a network where circuits or lines are connected. See Harry Newton, Newton’s Telecom Dictionary, 16th Ed., at 430.

⁶¹³ Fixed wireless equipment maker P-Com believes that PTP technology offers a better solution than PTMP for customer requirements above 45 Mbps. John Hodulik, Broadband Wireless Conference Call Series # 4 with P-Com, PaineWebber, Apr. 12, 2000.

⁶¹⁴ Winstar Communications, Inc., SEC Form 10-K405, Dec. 31, 1999, at 3-4.

⁶¹⁵ *Id.*

⁶¹⁶ See Section II.D, Major Lowerband Operators, *infra*.

⁶¹⁷ Centennial Communications has been operating a WLL system in Puerto Rico since 1997 using its broadband PCS spectrum. Its offering involves restricting the use of a mobile phone to one location, and many of its WLL customers use their handsets for their primary telecommunications line. *Bringing Local Loop to Puerto Rico*, WIRELESS BUSINESS & TECHNOLOGY, Jan. 1998, at 27; Elizabeth V. Mooney, *Wireless Is Foundation To Launch Other Services*, RCR RADIO COMMUNICATIONS REPORT, Nov. 8, 1999; Hargray Wireless, WLL offerings (visited Feb. 23, 2000) <<http://www.hargraywireless.com/products/plans.html>>.

service funds to offset high-cost residential telephone service,⁶¹⁸ wireless carriers, like local wireline carriers, must be granted Eligible Telecommunications Carrier (“ETC”) status by the state in which they plan to operate.⁶¹⁹ A few operators in the cellular and PCS bands have been granted ETC status and have become eligible for universal service funds, including Sprint PCS in California and Arkansas, United States Cellular Corp. in Washington, and Centennial Communications in Puerto Rico.⁶²⁰ As of year-end 2000, Western Wireless had received ETC approval in 10 states and had applications pending in three additional states.⁶²¹ At that time, the company was offering service to 2,500 customers in 100 communities in five states.⁶²²

MDS: What is commonly referred to as MDS or wireless cable spectrum includes 33 different 6 megahertz channels in the 2.1-2.2 GHz and 2.5-2.7 GHz spectrum bands. These channels include the Multipoint Distribution Service (“MDS”), Multichannel Multipoint Distribution Service (“MMDS”), and Instructional Television Fixed Service (“ITFS”) channels. MDS operators generally use the MMDS and MDS channels and lease excess capacity from ITFS operators, and often hold licenses for spectrum in different markets. MDS has become a new vehicle for offering high-speed Internet access and broadband services to residential and SOHO customers. MDS companies were originally licensed to provide analog television programming to homes. However, since 1997, they have instead refocused their business operations on offering high-speed Internet access.

WCS: WCS spectrum is located in the 2.3 GHz band. There are two 10 megahertz blocks of WCS spectrum covering the 52 Major Economic Areas (MEAs) of the United States, and two 5 megahertz blocks covering the 12 Regional Economic Area Groupings (REAGs). The spectrum was auctioned in April 1997 with flexible rules for its use by licensees.⁶²³ AT&T and WorldCom are currently using WCS spectrum to offer fixed wireless services in a few markets.⁶²⁴

Unlicensed: Unlicensed spectrum consisting of 26 megahertz in the 900 MHz band, 83.5 megahertz in the

⁶¹⁸ According to Western Wireless Chairman and CEO John Stanton, “If our competitor has the subsidies and we do not, then we can’t compete on equal footing.” *Western Wireless Breaks ETC Barrier For Wireless Providers*, COMMUNICATIONS TODAY, Oct. 5, 1999, available in 1999 WL 28525915.

⁶¹⁹ 47 U.S.C. § 214(e)(2).

⁶²⁰ See *Fifth Report* at 17788; Marcia Martinek, *No Place Like Home*, WIRELESS REVIEW, Oct. 1, 2000, available in 2000 WL 7119421; Universal Service Administrative Company, *Federal Universal Service Support Mechanisms Fund Size Projections and Contribution Base for the First Quarter 2001*, Appendix LI2, available at Quarterly Administrative Filings, High Cost & Low Income, Schools & Libraries, and Rural Health Care, <http://www.fcc.gov/ccb/universal_service/quarter.html#2001>.

⁶²¹ Western Wireless Corp., SEC Form 10-K405, Mar. 30, 2001, at 7.

⁶²² Ric Prentiss, et. al., *WWCA Reports 4Q00: Revenues and EBITDA Beat Our Expectations, Higher Churn*, RAYMOND JAMES & ASSOCIATES, INC., Feb. 13, 2001, at 1.

⁶²³ See FCC Auctions website (visited Jan. 24, 2001) <http://www.fcc.gov/wtb/auctions/> (“WCS spectrum may be used for any fixed, mobile, radiolocation or broadcast-satellite (sound) use consistent with the international agreements concerning spectrum allocations, and subject to the technical rules of Part 27, Title 47 of the Code of Federal Regulations.”)

⁶²⁴ See Section II.D, Major Lowerband Operators, *infra*.

2.4 GHz band, and 300 megahertz in the 5 GHz band is also used for fixed wireless communications.⁶²⁵ Operators can use these bands without an FCC license for a variety of radio transmissions, but are not protected from interference and may not cause interference to licensed users in the spectrum. Unlicensed fixed applications primarily use spread spectrum technology for long range transmissions in order to minimize the risk of interference with other operators. Unlicensed spectrum is used for many purposes, including short-range data transmissions,⁶²⁶ cordless phones, microwave ovens, and amateur radio; however, Appendix A focuses on its use for high-speed Internet access and other commercial broadband services.⁶²⁷

B. Recent Developments

During 2000, fixed wireless carriers took advantage of the Commission's increased flexibility regarding the use of MDS licenses. In September 1998, the Commission issued an order authorizing the use of MDS spectrum for two-way services.⁶²⁸ During August 2000, MDS licensees submitted approximately 2,300 applications to offer two-way services during a two-week filing window.⁶²⁹ On February 1, 2001, the Commission listed the applications that had been accepted for filing, and if no petitions to deny were filed on these applications within 60 days, they would be automatically granted.

In addition, as mentioned in Section II.B.1.c., *supra*, the Commission began the process of allocating spectrum for advanced wireless services, including 3G, during 2000. One of the bands under consideration for 3G services is the 2500-2690 MHz band, which is currently used by MDS and ITFS operators.⁶³⁰ In March 2001, the Commission and NTIA released final studies of how this band is used and its potential for accommodating 3G mobile systems.⁶³¹

C. Rollout

Over the past year, the Commission has begun tracking the rollout of fixed wireless services on a county-by-county basis.⁶³² Based on its analysis, the Commission estimates that there are at least

⁶²⁵ See, generally, 47 CFR Part 15.

⁶²⁶ See Section II.B.3.d., Short-Range Data Transmission, *supra*.

⁶²⁷ See Section II.D, Major Lowerband Operators, *infra*.

⁶²⁸ See *Fifth Report*, at 17789.

⁶²⁹ Prior to August 2000, several companies offered two-way MDS services pursuant to waivers granted by the Commission.

⁶³⁰ See Section II.B.1.c., 3G Developments, *supra*.

⁶³¹ Federal Communications Commission, Spectrum Study of the 2500-2690 MHz Band The Potential for Accommodating Third Generation Mobile Systems, *Final Report*, Mar. 30, 2001. Department of Commerce, The Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts, *Final Report*, Mar. 2001.

⁶³² This analysis is based on publicly-available information, such as news articles and operators' press releases, SEC filings, and web sites. There are several caveats to note when considering this data. First, in order to be considered as "covering" a county, an operator need only be offering service in a portion of that county. Second, the POPs and square mile figures in this analysis include all of the POPs and all of the square miles in a county considered to have coverage. Third, all population figures are based on 2000 Census estimates. Fourth,

276 different lowerband operators providing fixed wireless services in 526 different counties.⁶³³ These counties contain 150 million people, or 53 percent of the U.S. population.⁶³⁴

D. Major Lowerband Operators

AT&T Digital Broadband. At the writing of the *Fifth Report*, AT&T was serving 2,800 residential customers in the Dallas-Fort Worth, TX area with its fixed wireless Digital Broadband service.⁶³⁵ Since then, it has launched the service in San Diego and Los Angeles, CA; Houston, TX; and Anchorage, AK.⁶³⁶ As of January 2001, it had sold a total of 20,000 lines to 12,000 households.⁶³⁷ AT&T plans to deploy the service to 10 additional markets by the end of 2001, when the company expects it will cover about 3.5 million homes and have 100,000 customers.⁶³⁸ AT&T uses broadband PCS spectrum for Digital Broadband in Dallas, Anchorage, and San Diego, but uses WCS spectrum in Los Angeles and Houston and plans to use WCS spectrum in all of its subsequent fixed wireless rollouts.⁶³⁹ Using WCS for fixed wireless allows AT&T to allocate all of its broadband PCS spectrum for mobile service.⁶⁴⁰

For \$34.95 per month, AT&T's Digital Broadband service gives users up to four voice lines, unlimited local calling, long distance calling at five cents per minute for in-state calls and seven cents per minute for out-of-state calls, three advanced calling features, and unlimited, "always-on" Internet access for up to five computers with downstream speeds of up to 512 kbps and upstream speeds of 128 kbps.⁶⁴¹ AT&T is

because some lowerband carriers serve small and remote locations and because unlicensed operators provide service without a license from the Commission, it is difficult to assess precisely who is operating where in the lowerbands. Therefore, the analysis may not include certain companies that do not make the information on their fixed wireless offerings easily obtainable or publicly available.

⁶³³ See Appendix E, Map 7, p. E-8.

⁶³⁴ Many of these lowerband providers serve only business customers. Residential fixed wireless Internet access is available in at least 333 different counties. These counties contain approximately 100 million people or 35 percent of the U.S. population.

⁶³⁵ Digital Broadband is also referred to as Project Angel. See *Fifth Report*, at 17787.

⁶³⁶ *Blackwell Project Angel Article*; Marcia Martinek, *Angel in the Outfield*, WIRELESS REVIEW, Sept. 30, 2000, available in 2000 WL 7119396 ("Angel in the Outfield"); *Douglas Broadband Article*.

⁶³⁷ Sue Marek, *AT&T Wireless Trims Angel's Wings*, WIRELESS WEEK, Feb. 5, 2001, at 6.

⁶³⁸ *Id.* AT&T initially planned to serve 40 markets and 1.5 million potential customers by the end of 2001, but scaled back its plans in January 2001. *Id.*; *Angel in the Outfield*.

⁶³⁹ *Blackwell Project Angel Article*; *AT&T Names Next Fixed Wireless Cities, Selects Spectrum*, WASHINGTON TELECOM NEWSWIRE, July 25, 2000, available in 2000 WL 6837556 (quoting John Zeglis, Chairman of AT&T Wireless Group)

⁶⁴⁰ *Blackwell Project Angel Article*. AT&T also holds 39 GHz and LMDS licenses, although the company has released little public information on how it is using this spectrum. See *Fifth Report*, at 17801.

⁶⁴¹ *Blackwell Project Angel Article*; AT&T, *Digital Broadband Services California* (visited Apr. 4, 2001) <http://www.iatt.com/local/ca/local/local_services.html>. Digital Broadband costs AT&T \$700-\$750 per customer to deploy, and about two-thirds of that expense is for end-user equipment. AT&T expects prices to fall to around

planning to boost its downstream speeds to one Mbps in the future.⁶⁴² Furthermore, AT&T reports that 60 percent of its customers sign up for voice, as well as data, service.⁶⁴³

AT&T reports that, in Dallas, it is using the same towers to provide both fixed and mobile services and that only five additional towers had to be erected for Digital Broadband.⁶⁴⁴ In Anchorage, AT&T reportedly uses 20 towers for Digital Broadband, most of which are already used for mobile telephone service.⁶⁴⁵

AT&T originally planned to deploy Digital Broadband to homes and small businesses in markets not covered by its wireline broadband properties, namely its cable systems or arrangements with cable operators, which cover about 50 percent of U.S. markets.⁶⁴⁶ However, because AT&T is planning to split itself into four separate companies, its fixed wireless assets will become part of AT&T Wireless, while its cable properties will become part of AT&T Broadband.⁶⁴⁷ AT&T has attempted to avoid potential competition between its two spin-offs by prohibiting AT&T Wireless from offering fixed wireless service under the AT&T brand name in markets where AT&T Broadband is offering cable modem service.⁶⁴⁸

Sprint. As of April 2001, Sprint had launched Broadband Direct, its commercial MDS-based high-speed Internet access service, in 16 cities across the United States.⁶⁴⁹ As of October 2000, Sprint had approximately 10,000 customers in Phoenix, its first Broadband Direct market.⁶⁵⁰

Sprint's residential Broadband Direct service costs \$39.95 per month for downstream speeds of one Mbps⁶⁵¹ and upstream speeds of 512 kbps. Sprint also charges \$299 for installation, and \$99 for

\$500 per customer eventually. Jeff May, *Out of Thin Air – AT&T's Home-Grown 'Fixed Wireless' Technology Has Yet to Bear Fruit*, THE STAR-LEDGER, Sept. 10, 2000, available in 2000 WL 26254641.

⁶⁴² Douglas Broadband Article.

⁶⁴³ Jeff May, *Out of Thin Air – AT&T's Home-Grown 'Fixed Wireless' Technology Has Yet to Bear Fruit*, THE STAR-LEDGER, Sept. 10, 2000, available in 2000 WL 26254641.

⁶⁴⁴ *Angel in the Outfield*.

⁶⁴⁵ *Wireless Internet Gets Early Test in Alaska*, ASSOCIATED PRESS, Sept. 16, 2000.

⁶⁴⁶ See *Fifth Report*, at 17787.

⁶⁴⁷ *AT&T Splits into 4 Companies, Spinning Off Wireless Entirely*, MOBILE COMMUNICATIONS REPORT, Oct. 30, 2000, available in 2000 WL 8763494.

⁶⁴⁸ *Id.*

⁶⁴⁹ Phoenix and Tucson, AZ; San Francisco, Oakland, San Jose, and Fresno, CA; Denver, Boulder, and Colorado Springs, CO; Melbourne, FL; Wichita, KS; Detroit, MI; Oklahoma City, OK; Houston, TX; Salt Lake City, UT; and Chicago, IL. See *Sprint Introduces New Broadband Fixed Wireless Service to Chicago's Residential and Small Business Customers*, News Release, Sprint, Mar. 26, 2001.

⁶⁵⁰ Douglas Broadband Article.

⁶⁵¹ *Sprint Rolls Out Wireless DSL in Phoenix*, COMMUNICATIONS DAILY, May 9, 2000.

equipment with a two-year contract or \$299 for equipment for service on a monthly basis.⁶⁵² As mentioned in the *Fifth Report*, Sprint completed a major investment in MDS equipment manufacturer, Hybrid Networks, in 1999 and is using Hybrid Network's equipment in all of its Broadband Direct rollouts.⁶⁵³

Sprint holds MDS licenses covering 30 million people in 90 markets⁶⁵⁴ and plans to offer its fixed wireless product in 40 markets by the end of 2001.⁶⁵⁵ Sprint is targeting the 50 million homes it believes will not have access to any other type of broadband service over the next few years.⁶⁵⁶ In August 2000, Sprint filed applications to offer two-way services in 45 markets.⁶⁵⁷

In July 2000, Sprint, WorldCom, and Nucentrix Broadband Services, Inc. ("Nucentrix") developed technical agreements on spectrum management issues. These agreements allow MDS carriers to serve their entire geographic footprint without interference from MDS carriers in adjacent markets. More than 12 carriers have agreed to abide by the technical standards in the agreements.⁶⁵⁸

WorldCom. As the result of a series of acquisitions in 1999, WorldCom holds MDS licenses covering 45 million households in 78 markets.⁶⁵⁹ WorldCom is using these licenses to offer fixed wireless high-speed Internet access to residential and SOHO customers. As of January 2001, the company had launched service in three markets, Memphis, TN; Baton Rouge, LA; and Jackson, MS, and was running service trials in two additional markets: Boston, MA; and Dallas-Fort Worth, TX. In all of these cities except Boston, WorldCom is using both MDS and WCS spectrum.⁶⁶⁰ In August, WorldCom filed applications to offer two-way service in 60 markets⁶⁶¹ and, at that time, planned to roll out fixed wireless service to 30 metropolitan areas by the end of 2001.⁶⁶²

⁶⁵² This is in Denver. Erika Stutzman, *Sprint Wireless Comes to Boulder, Colo., Area*, KNIGHT-RIDDER TRIBUNE BUSINESS NEWS: DAILY CAMERA – BOULDER, COLORADO, Nov. 14, 2000, available in 2000 WL 29453622.

⁶⁵³ *Sprint Selects Hybrid Networks' Fixed Broadband Wireless System For Deployment of Sprint Broadband Direct in Fresno, Calif.*, News Release, Hybrid Networks, Jan. 23, 2001.

⁶⁵⁴ *Douglas Broadband Article.*

⁶⁵⁵ *Id.*

⁶⁵⁶ *Id.* (quoting Timothy Sutton, president of Sprint's broadband wireless group).

⁶⁵⁷ *Sprint Files for Two-Way MMDS Licenses in 45 Major Markets; Services Area Covers Nearly 25 Million Households, Plus Small Businesses*, PR NEWswire, Aug. 22, 2000.

⁶⁵⁸ *Nucentrix, Sprint, and WorldCom Announce Spectrum Management Plans*, News Release, Sprint, July 10, 2000.

⁶⁵⁹ *See Fifth Report*, at 17789.

⁶⁶⁰ *Id.*, at 17790.

⁶⁶¹ Matt Moore, *WorldCom Seeking Licenses for Fixed-Wireless Services*, ASSOCIATED PRESS NEWSWIREs, Aug. 15, 2000.

⁶⁶² Greg Keizer, *E-Goals for '01*, SMALL BUSINESS ADVISOR FROM ZDWIRE, Dec. 28, 2000, available in 2000 WL 31553911.

WorldCom is charging its residential customers \$39.95 per month for two-way speeds of up to 310 kbps and businesses \$300-\$600 per month for speeds ranging from 128 kbps to 8 Mbps.⁶⁶³

In addition to its commercial rollout plans, WorldCom announced in April 2000 that it would use MDS to deliver high-speed Internet access to schools, libraries, and community centers in four communities – Raleigh, NC; Houma, LA; Dothan, AL; and Hattiesburg, MS – beginning in August 2000 for the 2000/2001 school year.⁶⁶⁴

Nucentrix. Nucentrix currently offers two-way high-speed MDS-based Internet access service in Austin and Sherman-Denison, TX,⁶⁶⁵ and is conducting a trial of the service in Amarillo, TX. In February 2001, Nucentrix announced it would extend its trial in Amarillo, where it is testing Cisco's VOFDM technology with over 125 customers, until April 2001.⁶⁶⁶ Nucentrix holds MDS licenses that cover 90 small and medium markets across Texas and the Midwest.⁶⁶⁷ In August 2000, Nucentrix filed applications to offer two-way service in 70 markets.⁶⁶⁸

Other MDS Operators. In addition to the three companies discussed above, at least 23 other companies offer fixed wireless services using MDS spectrum in approximately 28 different counties.⁶⁶⁹ These companies are generally small, independent MDS licensees offering Internet access at speeds of up to 11 Mbps downstream to a limited number of residential and small business customers in one to three markets apiece. These markets are generally smaller towns and cities. For example, LMA Systems offers two-way Internet access at 1.54 Mbps downstream and 768 kbps upstream in Wilkes-Barre and Sunbury, PA.⁶⁷⁰ In addition, Alaska Wireless offers two-way MDS-based Internet access in Fairbanks, AK.⁶⁷¹ Some MDS carriers – including QuadraVision in Carson City and Reno, NV and American Rural TV in La Junta, CO – offer fixed wireless Internet access on a one-way basis and use a telephone line for the return path.

Providers in the Unlicensed Band. As mentioned above, Metricom uses unlicensed, as well as WCS,

⁶⁶³ Paul Kagan Associates, Inc., WIRELESS/PRIVATE CABLE INVESTOR, Mar. 9, 2000, at 1. WorldCom has stated that its capital expenditures for rolling out MMDS services are approximately \$2000 per square mile. *Telephony*, COMMUNICATIONS DAILY, Mar. 8, 2000.

⁶⁶⁴ *MCI WorldCom's Wireless Internet to Help Bridge the Digital Divide*, News Release, WorldCom, Apr. 26, 2000.

⁶⁶⁵ *Nucentrix Broadband Networks Announces Effectiveness of Shelf*, BUSINESS WIRE, Dec. 17, 1999.

⁶⁶⁶ *Nucentrix and Cisco Extend Broadband Wireless Trial in Amarillo*, News Release, Nucentrix, Feb. 2, 2001.

⁶⁶⁷ *Id.*

⁶⁶⁸ *Nucentrix Broadband Networks Announces FCC Notice of Fixed Wireless Applications*, News Release, Nucentrix, Nov. 30, 2000.

⁶⁶⁹ See Table 1, p. A-20.

⁶⁷⁰ LMA Systems, *Coverage Areas* (visited Mar. 6, 2001) <<http://www.lmasys.com/homepage.htm>>.

⁶⁷¹ *Regional Wireless Operators Select Hybrid Networks' 2-Way Today Solution to Launch Multiple Markets*, PR NEWswire, Jan 10, 2000.

spectrum for Ricochet, its wireless Internet access service provided by modem devices attached to laptop computers.⁶⁷² Ricochet offers users mobile Internet access speeds of 128 kbps in 13 markets,⁶⁷³ including Atlanta, Baltimore, Denver, Los Angeles, Minneapolis, New York City, and San Francisco.⁶⁷⁴ Metricom continues to operate its 28.8 kbps speed service in portions of San Francisco and in the Seattle and Washington, D.C. metropolitan areas while these markets are converted to 128 kbps service.⁶⁷⁵

Most of the other companies that use unlicensed spectrum to offer Internet access are local and regional ISPs that offer the service on a fixed, not mobile, basis in an average of three markets apiece. Many of these companies offer traditional wireline dial-up Internet access as well. In part because companies operate in these bands without a license from the Commission, it is difficult to track who is operating where. Estimates of the number of companies using unlicensed spectrum to provide Internet access vary. One equipment manufacturer estimates there are around 800,⁶⁷⁶ while another believes there are 50 to 100.⁶⁷⁷ One industry analyst estimates there are just under 200.⁶⁷⁸ Based on obtainable, publicly-available information, the Commission estimates there are at least 241 different companies using unlicensed spectrum to provide high-speed fixed wireless Internet access in approximately 503 different counties.⁶⁷⁹ Approximately 143 million people (or 50 percent of the U.S. population) live in counties with at least unlicensed fixed wireless Internet provider.

Most unlicensed operators offer Internet access speeds ranging from 384 kbps to 15 Mbps, with some advertising speeds as high as 100 Mbps. Many of the carriers are targeting business customers, while others serve both businesses and residences. Furthermore, many operators offer unlicensed Internet access in rural and underserved areas. For example, Canyon Country Communications offers Internet access in Page, AZ; Planet Connect offers fixed wireless service in Bristol, Seymour, Newport, and Greenville, TN; and DATACentric sells the service in Lufkin, Conroe, and Bryan-College Station, TX.⁶⁸⁰

Unlicensed spectrum is also used for short-range data transmissions and wireless LAN/WAN connections.

⁶⁷² See Section II.B.2.d(iii), Metricom, *supra*.

⁶⁷³ Metricom, *Coverage Maps* (visited Feb. 19, 2001) <http://www.metricom.com/about_us/coverage_maps/index.html>.

⁶⁷⁴ Metricom, Inc., SEC Form 10-K, Apr. 30, 2001, at 1.

⁶⁷⁵ *Id.*

⁶⁷⁶ *Unlicensed Update – The Service Providers*, BROADBAND WIRELESS BUSINESS, June/July 2000, at 25 (citing Tom Walusek, BreezeCOM). According to Walusek, the 800 includes ISPs with only one functioning link. *Id.*

⁶⁷⁷ *Id.* (citing Scott Plumlee, C-Spec).

⁶⁷⁸ *Unlicensed Update – The Service Providers*, BROADBAND WIRELESS BUSINESS, June/July 2000, at 25 (citing Andy Fuentes, Allied Business Intelligence).

⁶⁷⁹ See Appendix E, Map 8, p. E-9. This does not include Metricom, as its service is mobile. In addition, many of these companies offer only business service. Residential fixed wireless Internet access via unlicensed spectrum is offered in at least 309 different counties. These counties contain approximately 83 million people or 29 percent of the U.S. population.

⁶⁸⁰ See note 632, *supra*.

For example, MobileStar Networking Corp. (“MobileStar”) uses unlicensed spectrum to provide WLAN service in over 370 locations across the United States, including airports, hotels, restaurants, and multi-tenant office buildings.⁶⁸¹ Bluetooth and 802.11b, as discussed above, are two short range data transmission technology standards that operate using unlicensed spectrum.⁶⁸² Bluetooth is currently being integrated into numerous electronic devices, such as mobile phones, handheld devices, and personal computers, in order to allow users to transfer data among the devices without using wires or cables. 802.11b is a technology that is used to connect multiple computers to servers in wireless LANs.⁶⁸³

III. UPPERBANDS

The upperband carriers use three different bands – the 24 GHz band, the 28 GHz (LMDS) band, and the 39 GHz band – to offer business customers a variety of voice and broadband services, such as video programming distribution, video teleconferencing, and wireless local loop telephony, as well as Internet access and other high-speed data transmission services.⁶⁸⁴ Upperband carriers operate in 83 counties across the United States.⁶⁸⁵ As is the case with lowerband operators, many upperband operators use multiple spectrum bands to offer nearly identical services. Recent developments in the upperband fixed wireless sector, as well as the major upperband operators, are discussed in detail below.

A. Recent Developments

Auctions. As discussed in the *Fifth Report*, the Commission completed the auction of 2,450 39-GHz licenses in May 2000.⁶⁸⁶ During 2000 and 2001, the Commission adopted rules for auctioning and licensing 24 GHz spectrum.⁶⁸⁷ 24 GHz licenses will consist of 80 megahertz of spectrum in each of the 172 Economic Areas (“EAs”) in the United States, and licensees will be permitted to offer a variety of fixed wireless services.⁶⁸⁸ As with the 39 GHz band, the 24 GHz band is encumbered by existing fixed wireless operators, in this case, mainly Teligent, Inc. (“Teligent”).

Bankruptcies. During 2000 and early 2001, financing for all CLECs, including upperband fixed wireless

⁶⁸¹ MobileStar, *Locations* (visited May 28, 2001) <<http://www.mobilestar.net/locations/page5.asp>>. Mobile professionals who subscribe to MobileStar’s service can bring their handheld devices and laptop computers to these locations and obtain high-speed Internet access without attaching a cord or cable. The buildings may then connect to the Internet using wireline technology.

⁶⁸² See Section II.B.3.d., Short Range Data Transmissions, *supra*, for a detailed discussion.

⁶⁸³ *Id.*

⁶⁸⁴ 24 GHz spans 24.25 - 25.25 GHz; LMDS spans 27.5 - 31.3 GHz; 39 GHz spans 38.6 - 40.0 GHz. 39 GHz is often referred to as 38 GHz.

⁶⁸⁵ See Appendix E, Map 9, at E-10.

⁶⁸⁶ See *Fifth Report*, at 17795.

⁶⁸⁷ Amendments To Parts 1, 2, 87 and 101 of the Commission’s Rules To License Fixed Services at 24 GHz, *Report and Order*, 15 FCC Rcd 16934 (2000); Amendments To Parts 1, 2, 87 and 101 of the Commission’s Rules To License Fixed Services at 24 GHz, *Order on Reconsideration*, FCC 01-151 (rel. May 17, 2001).

⁶⁸⁸ *Id.*

carriers, dropped significantly from its 1999 levels. CLECs have traditionally required large investments to deploy their networks and build their businesses. Analysts believe that the slowing economy and declining stock values in 2000, as well as the substantial debt incurred by major upperband carriers and their inability to show a profit, have made it difficult for these companies to acquire additional financing.⁶⁸⁹ The result of these financial difficulties has been that three major upperband carriers, Winstar, Advanced Radio Telecom Corp. (“ART”), and Teligent, declared bankruptcy during the first half of 2001.

On April 18, 2001, Winstar filed for Chapter 11 bankruptcy protection.⁶⁹⁰ At the same time, the company filed a \$10 billion lawsuit against Lucent alleging that Lucent had violated its vendor financing agreement with Winstar and had thereby forced Winstar into bankruptcy.⁶⁹¹ At the time of its bankruptcy, Winstar obtained \$75 million in debtor-in-possession (“DIP”) financing from several investment banks and planned to continue operating and serving its existing customers.⁶⁹²

On March 30, 2001, ART announced its plans to file a petition for Chapter 11 bankruptcy due to distressed capital markets and its inability to obtain financing.⁶⁹³ The company stated it would continue to serve its existing customers for 30 days in order to enable them to transition to other service providers.⁶⁹⁴ Prior to its bankruptcy, ART sold fixed wireless broadband services wholesale and to business customers in nine U.S. markets.⁶⁹⁵ The company held 39 GHz licenses covering the entire United States.⁶⁹⁶ In August 2000, ART completed the acquisition of 366 39 GHz licenses from Broadstream Communications

⁶⁸⁹ Scott Moritz, *Funding Crunch Threatens Winstar, Networking Backers*, THESTREET.COM, Feb. 27, 2001; Eileen Kinsella, *Sector Spotlight: Banks Wince at Looming Telecom Debt Worries*, THESTREET.COM, Mar. 5, 2001; *Teligent Posts Wider 4th-Quarter Loss on Aggressive Network Expansion*, DOW JONES NEWS SERVICE, Feb. 28, 2001; Peter Loftus, *Data-Equipment Firms Trim Views as Spending Slims*, THE WALL STREET JOURNAL, Jan. 16, 2001, available in 2001 WL-WSJ 2851064.

⁶⁹⁰ *Winstar Files Voluntary Chapter 11 Petition*, News Release, Winstar, Apr. 18, 2001.

⁶⁹¹ Winstar and Lucent had a five-year supply agreement, and Lucent had lent Winstar \$700 million. On April 16, 2001, Lucent declared that Winstar was in default on that agreement. Jonathan Stempel, *Winstar Files for Bankruptcy, Blames Lucent*, Reuters, Apr. 18, 2001. Winstar is suing Lucent for breach on contract on its strategic partnership agreement with Winstar. Winstar is also seeking \$90 million in immediate injunctive relief, which Winstar claims Lucent failed to pay to Winstar on March 30, 2001 as part of their agreement. However, Winstar claims that its ability to emerge from bankruptcy is not contingent on the receipt of any damage award in this lawsuit. *Winstar Files \$10 Billion Suit Against Lucent Technologies*, News Release, Winstar, Apr. 18, 2001.

⁶⁹² *Winstar Files Voluntary Chapter 11 Petition*, News Release, Winstar, Apr. 18, 2001.

⁶⁹³ *Advanced Radio Telecom to File Petition for Chapter 11 Bankruptcy Protection*, News Release, ART, Mar. 30, 2001.

⁶⁹⁴ *Id.*

⁶⁹⁵ See *Fifth Report*, at 17800; *Advanced Radio Telecom Announces New Customers*, News Release, ART, Dec. 8, 2000; *Advanced Radio Telecom Announces Third Quarter 2000 Financial Results*, News Release, ART, Nov. 13, 2000 (San Jose, Los Angeles, Washington DC, Houston, Seattle, Phoenix, Portland, Dallas/Ft. Worth, and San Diego).

⁶⁹⁶ *Advanced Radio Telecom Announces Third Quarter 2000 Financial Results*, News Release, ART, Nov. 13, 2000. Qwest Communications International Inc. (“Qwest”) has a 19 percent stake in ART. See *Fifth Report*, at 17800.

Corporation and its affiliates, and 14 39 GHz licenses from Bachow Communications Incorporated.⁶⁹⁷

On May 21, 2001, Teligent filed for Chapter 11 bankruptcy protection after the company failed to come up with additional financing and faced default on its credit agreement.⁶⁹⁸ During the month prior to its bankruptcy, IDT Corp. ("IDT"), a wholesale long distance and prepaid calling card provider that also purchases telecommunications assets at a discount, became the largest shareholder in Teligent.⁶⁹⁹ Coincident with that, Teligent announced its plans to scale back operations of the company.⁷⁰⁰ Teligent plans to reorganize and has received funding in order to continue its operations in the near term.⁷⁰¹

Flat Rate Pricing Plans. During 2000 and early 2001, four upperband carriers – Winstar, Teligent, XO Communications, Inc. ("XO," formerly Nextlink Communications), and ART – began offering flat rate pricing plans designed for small and medium sized businesses. For example, Teligent announced the launch of its Integrated Access service in its top 21 markets during February 2001.⁷⁰² With Integrated Access, businesses can receive a bundle of digital and analog voice and data services over a single high-capacity link for a low flat monthly rate.⁷⁰³ Teligent has been targeting businesses with around 25 employees for the service.⁷⁰⁴ In September 2000, XO introduced XOptions in all of its markets. XOptions is a group of flat-rate service packages combining local, long distance, Internet access, and web-hosting services.⁷⁰⁵

B. Major Operators

Teligent. Since 1998, Teligent has provided a bundle of broadband fixed wireless telecommunications services to small and medium sized businesses using a combination of its 24 GHz licenses, which cover 74 markets nationwide,⁷⁰⁶ and leased wireline networks. At the end of 2000, Teligent's customer base had

⁶⁹⁷ See *Fifth Report*, at 17800; *Advanced Radio Telecom Closes Major Acquisitions*, News Release, ART, Aug. 28, 2000.

⁶⁹⁸ *Teligent Files for Chapter 11 Bankruptcy Protection*, REUTERS, May 21, 2001.

⁶⁹⁹ Shawn Young, *IDT Scavenges for Bargains In Phone-Upstart Wreckage*, THE WALL STREET JOURNAL, May 11, 2001, available at www.wsj.com; Yuki Noguchi, *Teligent to Cut 900 Jobs – Sources Say Firm Is Near Bankruptcy*, WASHINGTON POST, May 11, 2001, at E-1.

⁷⁰⁰ *Id.*

⁷⁰¹ *Teligent Files for Chapter 11 Bankruptcy Protection*, REUTERS, May 21, 2001.

⁷⁰² *Teligent Launches High-Capacity 'Integrated Access' Solution for Businesses*, News Release, Teligent, Feb. 21, 2001.

⁷⁰³ *Id.*

⁷⁰⁴ *Id.*

⁷⁰⁵ *Nextlink and Concentric Become XO Communications*, News Release, XO, Sept. 25, 2000; *XO Communications \$450 Mln Notes Rated CCC+ By S&P*, CAPITAL MARKETS REPORT, Jan. 9, 2001.

⁷⁰⁶ *Teligent Reports Third Quarter Financial Results, Completes Launch of First 15 Markets*, News Release, Teligent, Nov. 11, 1998.

grown to 35,500, up 236 percent from its 15,000 customers at the end of 1999.⁷⁰⁷ Teligent had also installed 490,318 lines, up 195 percent from the end of 1999, and had 4,469 buildings “on-net” (i.e., connected to Teligent’s network), up 79 percent from 2,500 at the end of 1999.⁷⁰⁸ Of those 4,469 on-net buildings, 60 percent had fixed wireless installations.⁷⁰⁹ And 90 percent of the 327 on-net buildings added during the fourth quarter of 2000 were equipped with fixed wireless connections.⁷¹⁰

Despite this growth, Teligent’s financial difficulties, including a heavy debt load and inability to obtain additional financing, forced the company into bankruptcy in May 2001. As of April 2001, Teligent had been serving 43 U.S. markets.⁷¹¹ Teligent recently announced its plan to cut back operations in at least 11 markets.⁷¹²

Winstar. As of April 2001, Winstar was using its 28 GHz and 39 GHz licenses to provide a package of WLL services in 60 markets nationwide. Winstar sells local, long distance, high-speed data and Internet access, and information services to business customers and other carriers at speeds up to 155 Mbps.⁷¹³ Winstar finished 2000 with 1,040,000 access lines, an increase of 68 percent from the end of 1999.⁷¹⁴ Approximately 52 percent of those one million lines were on-net, and 85 percent of the 120,000 lines added during the fourth quarter of 2000 were on-net.⁷¹⁵ Winstar also had 4,400 buildings on-net at the end of 2000, up 159 percent from its 1,700 buildings on-net at the end of 1999.⁷¹⁶ Those 4,400 buildings contain 125,000 businesses.⁷¹⁷ Winstar also had access rights to over 14,700 buildings, which contain 400 hub sites.⁷¹⁸ At the end of 2000, 250 of those hub sites were operational, up from 142 at the end of 1999.⁷¹⁹ On April 5, 2001, Winstar announced that, due to its financial difficulties, it was halting its plans for domestic and international expansion,⁷²⁰ and on April 18, 2001, the company filed for bankruptcy.⁷²¹

⁷⁰⁷ *Teligent Reports \$152 Million in 2000 Revenue; Records Nearly 400 Percent Growth in Second Full Year of Operations*, News Release, Teligent, Feb. 28, 2001.

⁷⁰⁸ *Id.*

⁷⁰⁹ *Id.*

⁷¹⁰ *Id.*

⁷¹¹ See Teligent, *About Us* (visited Apr. 23, 2001) <<http://www.teligent.com/docs/aboutus.html>>.

⁷¹² Yuki Noguchi, *Teligent to Cut 900 Jobs – Sources Say Firm Is Near Bankruptcy*, WASHINGTON POST, May 11, 2001, at E-1.

⁷¹³ See *Fifth Report*, at 17797.

⁷¹⁴ *Winstar Reports Strong Fourth Quarter Results*, News Release, Winstar, Feb. 27, 2001; See *Fourth Report*, at E-13.

⁷¹⁵ *Winstar Reports Strong Fourth Quarter Results*, News Release, Winstar, Feb. 27, 2001.

⁷¹⁶ *Id.*

⁷¹⁷ *Id.*

⁷¹⁸ *Id.*

⁷¹⁹ *Id.*

⁷²⁰ *Winstar Communications Cuts 2,000 Jobs*, REUTERS, Apr. 5, 2001.

XO Communications (formerly Nextlink). XO holds LMDS and 39 GHz licenses covering 95 percent of the population of the 30 largest U.S. cities and offers fixed wireless broadband services using those licenses to business customers in 27 markets.⁷²² XO also operates facilities-based CLEC networks that provide wireline telecommunications services in 53 markets across the United States.⁷²³ The company uses both wireline and fixed wireless technologies to connect its customers to its network, and in places where a fiber connection is not practical or economic, XO deploys fixed wireless broadband connections between an antenna on its customer's roof and an antenna attached to XO's fiber ring.⁷²⁴ XO claimed that, as of February 2001, it served more than 1,900 buildings using its own facilities.⁷²⁵

In June 2000, XO completed its acquisition of DSL provider, Concentric Network Corporation ("Concentric").⁷²⁶ Prior to the merger, XO had formed a partnership with Concentric, in which the companies jointly offered voice, DSL, and dedicated Internet services, with one bill and one point of contact.⁷²⁷ The DSL facilities give XO a third facilities-based vehicle, in addition to fiber and fixed wireless, for accessing business customers.⁷²⁸

Touch America. Touch America holds LMDS licenses covering significant portions of the inland Pacific Northwest, northern and central Rocky Mountain regions and the northern Plains states.⁷²⁹ The company uses both its fixed wireless and wireline assets, which include an 18,000-route-mile fiber network, to provide voice and data services to business and government customers, as well as to other carriers. Touch America currently offers voice and data services using LMDS spectrum in four locations: Billings and Butte, MT; Boise, ID; and Spokane, WA.⁷³⁰ In each city, Touch America has deployed one base station with a three mile radius.⁷³¹

⁷²¹ *Winstar Files Voluntary Chapter 11 Petition*, News Release, Winstar, Apr. 18, 2001.

⁷²² *XO Communications Reports Strong Fourth Quarter Results*, News Release, XO, Feb. 5, 2001; XO Communications, Inc., SEC Form 10-K, Apr. 2, 2001, at 2.

⁷²³ *XO Communications \$450 Mln Notes Rated CCC+ By S&P*, CAPITAL MARKETS REPORT, Jan. 9, 2001. XO operates 35 metropolitan fiber networks in 21 states and the District of Columbia. XO Communications, Inc., SEC Form 10-K, Apr. 2, 2001, at 2.

⁷²⁴ XO Communications, Inc., SEC Form 10-K, Apr. 2, 2001, at 11.

⁷²⁵ *XO Communications Reports Strong Fourth Quarter Results*, News Release, XO, Feb. 5, 2001.

⁷²⁶ *Nextlink and Concentric Close \$2.54 Billion Equity Value Merger Creating Broadband Communications Powerhouse*, BUSINESS WIRE, June 19, 2000.

⁷²⁷ *Id.*

⁷²⁸ *Id.*

⁷²⁹ *See Fifth Report*, at 17799.

⁷³⁰ Gerry Blackwell, *Bringing State-of-the-Art Broadband Services to Big Sky Country*, B BROADBAND WIRELESS BUSINESS, June/July 2000, at 14. *See* Table A-2, p. A-21.

⁷³¹ Gerry Blackwell, *Bringing State-of-the-Art Broadband Services to Big Sky Country*, B BROADBAND WIRELESS BUSINESS, June/July 2000, at 14.

Touch America is the wholly owned telecommunications subsidiary of the Montana Power Company, which, in March 2000, decided to divest its energy businesses to focus exclusively on telecommunications.⁷³² Montana Power expects to complete the divestiture by the second quarter of 2001, at which time Touch America will become the name of the parent corporation.⁷³³ In June 2000, Touch America completed the acquisition of Qwest Communication International's long-distance business, which included 250,000 customers throughout the 14-state territory of the former US WEST.⁷³⁴

HighSpeed Communications. HighSpeed Communications ("HighSpeed," formerly HighSpeed.Com) holds LMDS licenses covering nearly 14 million POPs throughout Washington, Oregon, Idaho, Hawaii, Colorado and Nevada, as well as a large part of the Central Valley of California.⁷³⁵ HighSpeed has begun offering service using its LMDS licenses in Walla Walla, WA; Bend, OR; Bakersfield, CA and Boise, ID.⁷³⁶ The company targets small and medium-sized business customers in tier 1 and tier 2 markets in the western United States and offers only data, not voice, services at speeds ranging from 1.54 to 155 Mbps.⁷³⁷ In two of its markets, HighSpeed has deployed service by purchasing or partnering with a local ISP.⁷³⁸ In 1999, XO (then Nextlink) acquired a 15 percent equity position in HighSpeed.⁷³⁹

e-xpedient/CAVU Inc. ("e-xpedient"). E-xpedient holds 39 GHz licenses and offers fixed wireless broadband services to businesses in multi-tenant buildings in six cities: Salt Lake City, UT; Cleveland, OH; Oklahoma City, OK; Jacksonville, FL; Orlando, FL; and Miami, FL.⁷⁴⁰ In Miami, e-xpedient also uses 60 GHz spectrum and free-space optics technology.⁷⁴¹ E-xpedient has set up its network in a ring

⁷³² *Montana Power to Divest Energy Businesses, Company to Become Touch America*, News Release, Touch America, Mar. 28, 2000.

⁷³³ *Earnings up as Montana Power Becomes Touch America*, ASSOCIATED PRESS NEWSWIREs, Jan. 30, 2001; *Montana Power Reports 2000 Annual and Fourth-Quarter Earnings*, News Release, Montana Power Company, Jan. 30, 2001.

⁷³⁴ *Earnings up as Montana Power Becomes Touch America*, ASSOCIATED PRESS NEWSWIREs, Jan. 30, 2001; *Touch America Completes Acquisition of Qwest Communications' 14-State Long Distance Business*, News Release, Touch America, June 30, 2000. See *Fifth Report*, at 17799.

⁷³⁵ *HighSpeed.Com Completes Acquisition of LMDS Licenses in Nevada*, News Release, Highspeed, Oct. 27, 2000.

⁷³⁶ Timothy Downs, *Speed to Market the Calling Card of LMDS Licensee HighSpeed.Com*, BROADBAND WIRELESS BUSINESS, June/July 2000, at 13, 32.

⁷³⁷ *Id.*

⁷³⁸ *Id.*

⁷³⁹ *Id.*

⁷⁴⁰ Charles F. Mason, *Can a Broadband Wireless Carrier Provide Both Quality Service and Profits?*, BROADBAND WIRELESS BUSINESS, Jan. 2001, at 1, 16; e-xpedient, *Markets* (visited Apr. 23, 2001) <<http://www.e-xpedient.com/customer/markets.html>>.

⁷⁴¹ *e-xpedient Launches First Commercial Network to Use 60 GHz and Free-Space Optics to Deliver 100 Mbps Internet Access to Businesses in Miami*, News Release, e-xpedient, Apr. 17, 2001.

configuration by linking 10 to 20 buildings in a ring with fixed wireless connections and creating a 100 Mbps IP-based path in each direction. The company offers 100 Mbps Internet access starting at \$100 per month to all of the customers located in its networked buildings.⁷⁴²

⁷⁴² Steve Stroh, *Going Wireless with Invisible Fiber*, BOARDWATCH, Feb. 2001.

Table 1: Fixed Wireless Internet Access Offerings with MDS/ITFS Spectrum

Company	Location	Reported Speed
Advanced Wireless Systems, Inc.	Reading, PA Clarksville, TN Shreveport, LA Mobile, AL Baton Rouge, LA	N/A
Alaska Wireless Cable	Fairbanks, AK	N/A
American Rural TV	La Junta, CO	N/A
Bay Junction Technology/ iSpeed	Santa Clara, CA	1.5 Mbps
Cache Valley AIRNET	Cache Valley, UT	5 Mbps
CFW Communications (formerly R&B Telephone)	Daleville, VA	10 Mbps
Digital Broadcast Corp.	Roanoke, VA	N/A
HiWAAY Information Services	Huntsville, AL	256 kbps
IJNT.net, Inc.	Salt Lake City, UT Beaumont, TX	10 Mbps
LMA Systems	Sunbury, PA Wilkes-Barre, PA	768 kbps-1.54 Mbps
NextNet (equipment trials)	Olympia, WA Waseca, MN	N/A
Nucentrix Broadband Networks, Inc.	Austin, TX Sherman, TX Amarillo, TX (trial)	1.54 Mbps
Ohio Valley Wireless - Cable	Evansville, IN	1.5 Mbps
Oxford Telecom	Portland, ME	N/A
QuadraVision	Reno/Sparks, NV Carson City, NV	1.5 Mbps
Rocky Mountain Internet	Denver, CO	750 kbps
Sioux Valley Wireless	Sioux Falls, SD	4 Mbps
SkyLynx Communications	Fresno, CA Sarasota, FL	11 Mbps
SoFast Internet Services	Great Falls, MT	128 kbps-1.5 Mbps
Sprint	16 markets nationwide	512 kbps - 1 Mbps
Telecom Wireless Corp./ TCOM Ventures	Key West, FL	N/A
Third Rail Communications	Nashua, NH	N/A
Universal Rapid Access	Logan, UT	N/A
U.S. Interactive dba AccelerNet	Houston, TX	10 Mbps
Virginia Communications/ eSpeed	Prescott Valley, AZ	768 kbps
WatchTV	Lima, OH	N/A
Wireless First	Traverse City, MI	256 kbps
World Wide Wireless Communications	Concord, CA	9 Mbps
WorldCom	Baton Rouge, LA Jackson, MI Memphis, TN	310 kbps (residential) 8 Mbps (business)
	Dallas-Ft. Worth, TX (trial) Boston, MA (trial)	310 kbps (residential) 8 Mbps (business)

Source: Information is based on publicly available documents such as news releases, newspaper and periodical articles, company web pages, and SEC filings through April 2001.

Table 2: LMDS Launches

Company	Location	Status
XO Communications	27 markets nationwide	Launched commercial service after field tests
Winstar	Holds 9 LMDS A-block licenses, including the San Francisco-Oakland BTA	Uses LMDS licenses in conjunction with 39 GHz licenses to offer package of WLL services to businesses; declared bankruptcy in April 2001
South Central Telecom	Medicine Lodge, KS	Offers telemedicine, distance learning, and leased line services
Virginia Tech University	Blacksburg, VA	Uses 4 LMDS licenses to provide two-way high-speed data, voice, and video from an on-campus to three off-campus office buildings
Touch America	Billings and Butte, MT	Full voice and data service to business and government
SpeedUS.com (formerly CellularVision)	New York metro	Facilities-based high-speed Internet service
Central Texas Communications	San Angelo and Goldthwaite, TX	Offers voice and high-speed Internet access to businesses at 128 kbps to 10 Mbps
PVT Networks (subsidiary of Penasco Valley Telephone)	Artesia, NM	Testing LMDS
US Unwired	Lake Charles, LA	Voice and data trials
Liberty Cellular (acquired by Alltel)	Salina, KS	Service trial started in mid-1999
Home Telephone, Inc.	Charleston, SC	Trials
HighSpeed Communications	Walla Walla, WA Bend, OR Boise, ID Bakersfield, CA	data services to small and medium-sized businesses at speeds ranging from 1.54 to 155 Mbps
Prime Companies, Inc.	8 LMDS licenses cover one million people and 35,000 businesses in western Pennsylvania and southern New York	Offers broadband service to businesses in New Castle and Oil City, PA; also uses unlicensed spectrum to serve residential customers
Frazier/King Media	Irving, TX	LMDS demonstration to deliver voice, data, and video services to residences and businesses

Source: Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *Third Report and Order and Memorandum Opinion and Order*, FCC 00-223, Appendix B, released June 27, 2000; Information is also based on publicly available documents through April 2001 such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

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Table 1A: FCC Auctions Summary - Service Design

Auction Number and Name	Number of Licenses (1)	Geographic License Scheme (2)	Spectrum per license	Total Spectrum per Market	Service Description
1 Nationwide Narrowband PCS	11 (3)	Nationwide	11 blocks: 5 = 50/50 kHz, 3 = 50/12.5 kHz, 2 = 50 kHz	0.7875 MHz	Advanced paging/data
2 Interactive Video and Data Service	594	MSA	2 blocks of 500 kHz	1 MHz	Interactive data
3 Regional Narrowband PCS	30	Regional	6 blocks: 2 = 50/50 kHz, 4 = 50/12.5 kHz	0.45 MHz	Advanced paging/data
4 A & B block Broadband PCS	102 (4)	MTA	2 blocks of 30 MHz	60 MHz	Mobile voice and data
5/10 C block Broadband PCS /22 (5)	493	BTA	1 block of 30 MHz or 2 blocks of 15 MHz	30 MHz	Mobile voice and data
6 Multichannel Distribution Service	493	BTA	Max of 13 channels of 6 MHz	78 MHz (6)	Wireless cable
7 900 MHz Specialized Mobile Radio	1020	MTA	20 blocks of .25 MHz	5 MHz	Mobile voice and data
8 Digital Broadcast Service (7)	1	Full US Coverage	500 MHz	437.5 MHz	Multichannel video
9 Digital Broadcast Service (7)	1	Partial US Coverage	Uses same spectrum as full coverage license	375 MHz	Multichannel video
11/ D, E, & F block Broadband PCS (8)	1479	BTA	3 blocks of 10 MHz	30 MHz	Mobile voice and data
12 Cellular Unserved	14	MSA/RSA	2 blocks of 25 MHz	50 MHz	Mobile voice and data
13 Interactive Video and Data Service	981	MSA/RSA	2 blocks of 500 kHz	1 MHz	Interactive data
14 Wireless Communications Service	128	MEA/REAG	4 blocks: 2 = 10 MHz, 2 = 5 MHz	30 MHz	(9)
15 Digital Audio Radio Service	2	Full US Coverage	2 blocks of 12.5 MHz	25 MHz	Multichannel audio
16 Upper 800 MHz Specialized Mobile Radio	525	EA	3 blocks: 1 MHz, 3 MHz , and 6 MHz	10 MHz	Mobile voice and data
17/ Local Multipoint Distribution Service	986 (10)	BTA	2 blocks: 1150 MHz and 150 MHz	1300 MHz	Fixed voice, data and video
18/ 220 MHz	908	National, EAG, EA	13 blocks: 3 = 100 kHz, 5 = 100 kHz, 5 = 150 kHz	1.55 MHz	Voice, data, paging, fixed
20 VHF Public Coast	42	Pub. Coast Station Areas	1 block between 350 and 500 kHz	350 to 500 kHz	Fixed and mobile
21 Location and Monitoring Service	528	EA	3 blocks: 2 = 6 MHz, 1 = 2.25 MHz	14.25 MHz	Mobile telemetry
25/ "Closed" Broadcast	118	n/a	(11)	(11)	Broadcast TV and radio
26 929 and 931 MHz Paging Service	2,499	MEA	49 blocks of 20 kHz: 12 in 929 Band, 37 in 931 band.	790 kHz	Paging and messaging
30 39 GHz	2,450	EA	14 Blocks of 100 MHz	1400 MHz	Fixed (12)
33/ 700 MHz Guard Band	104	MEA	2 Blocks: 1= 4 MHz, 1 = 2 MHz	6 MHz	(13)
34 SMR 800 MHz General Category	1,050	EA	6 Blocks of 1.25 MHz (14)	7.5 MHz	Mobile voice and data
35 PCS C & F Block (5)	422 (15)	BTA	Up to 4 blocks of 10 MHz; Up to 2 blocks of 15 MHz	10 to 40 MHz	Mobile voice and data
36 SMR 800 MHz Lower 80 Channels	2,800	EA	16 Blocks of .25 MHz	4 MHz	Mobile voice and data

Source: Federal Communications Commission

- (1) This is the total number of licenses initially auctioned in each service. It does not take into account any partitioning and disaggregation activity. Some of these licenses may not have been granted.
- (2) MTAs = Major Trading Areas, BTAs = Basic Trading Areas, MSAs = Metropolitan Statistical Areas, RSAs = Rural Service Areas, MEAs = Major Economic Areas, REAGs = Regional Economic Area Groups, EAs = Economic Areas.
- (3) Includes one pioneer preference license.
- (4) Includes three pioneer preference licenses.
- (5) To date, four auctions have been completed that included C block PCS licenses (Auctions Nos. 5, 10, 22 and 35).
- (6) To be precise, Multipoint Distribution Service (MDS) total spectrum should be 76 MHz because Channel 2 was originally 6 MHz only in the top 50 markets. In the rest of the markets, it was Channel 2A with 4 MHz. As noted in the MDS Auction Procedures, Terms, and Conditions: "In 1992, the 2160-2162 MHz frequency was reallocated to emerging technologies, and thus, any subsequent MDS use of these 2 MHz will be secondary."
- (7) There is a total of 500 MHz of DBS downlink spectrum available. The same spectrum can be reused at each of the eight U.S. DBS orbital slots. The figures in the table are $(28/32) \times 500$ and $(24/32) \times 500$, respectively, but they each refer to portions of the same 500 MHz of spectrum.
- (8) To date, two auctions have been completed that included DEF block PCS licenses, the original and one reauction.
- (9) WCS is permitted to implement a wide range of services, subject to FCC engineering requirements, including fixed, mobile, radio location, and broadcasting-satellite (sound) service.
- (10) Cellularvision, Inc. has been granted a pioneer preference for a portion of the 1150 MHz New York BTA, of which 850 MHz was subsequently sold to Winstar Communications, Inc.
- (11) The "Closed" Broadcast auctions included a number of different licenses used for broadcast television and radio. The types of licenses included: AM Broadcast (10 kHz per license), FM Broadcast (200 kHz per license), FM Translator (200 kHz), TV Broadcast (6 MHz per license), Low Power TV (6 MHz per license), and TV Translator (6 MHz per license).
- (12) Mobile communications are subject to the development of inter-licensee and inter-service interference criteria.
- (13) The Guard Band Manager is a new class of commercial licensee engaged solely in the business of leasing spectrum to third parties on a for-profit basis. The Guard Band Manager may subdivide its spectrum in any manner it chooses and make it available to system operators, or directly to end users for fixed or mobile communications. Entities that employ a cellular system architecture are prohibited from operating in this band.
- (14) Additionally, the Commission offered 3 EA licenses in the 800 MHz Upper Band: one 1 MHz license in Honolulu, HI (EA 172); one 3 MHz license and one 6 MHz license in Guam and Northern Mariana Islands (EA 173).
- (15) 170 licenses were available only to entrepreneurs in closed bidding. 252 licenses were available to all bidders in open bidding.

**Table 1B: FCC Auctions Summary
Auction Results**

Auction Number(s) and Name	Total Winning Bids (1)	Auction Began	Auction Ended	# Rounds	Number of Winning Bidders
1 Nationwide Narrowband PCS	\$650,306,674	7/25/94	7/29/94	47	6
2 Interactive Video and Data Service	\$213,892,375	7/28/94	7/29/94	Oral Outcry	178
3 Regional Narrowband PCS	\$392,706,797	10/26/94	11/8/94	105	9
4 A & B block Broadband PCS	\$7,721,184,171	12/5/94	3/13/95	112	18
5/ C block Broadband PCS (2)	\$10,071,708,841.50	12/18/95	5/6/96	184	89
	\$904,607,466.75	7/3/96	7/16/96	25	7
	\$409,936,425.00	3/23/99	4/15/99	78	57
6 Multichannel Distribution Service	\$216,239,603	11/13/95	3/28/96	181	67
7 900 MHz Specialized Mobile Radio	\$204,267,144	12/5/95	4/15/96	168	80
8 Digital Broadcast Service	\$682,500,000	1/24/96	1/25/96	19	1
9 Digital Broadcast Service	\$52,295,000	1/25/96	1/26/96	25	1
11/ D, E, & F block Broadband PCS (3)	\$2,517,439,565	8/26/96	1/14/97	276	125
	\$2,904,520	3/23/99	4/15/99	78	6
12 Cellular Unserved	\$1,842,533	1/13/97	1/21/97	36	10
14 Wireless Communications Service	\$13,638,940	4/15/97	4/25/97	29	17
15 Digital Audio Radio Service	\$173,234,888	4/1/97	4/2/97	25	2
16 Upper 800 MHz Specialized Mobile Radio	\$96,232,060	10/28/97	12/8/98	235	14
17/ Local Multipoint Distribution	\$578,663,029	2/18/98	3/25/98	127	104
	\$45,064,450	4/27/99	5/12/99	43	40
18/ 220 MHz	\$21,650,301	9/15/98	10/22/98	173	44
	\$1,924,950	6/8/99	6/30/99	71	16
20 VHF Public Coast	\$7,459,200	12/3/98	12/14/98	44	4
21 Location and Monitoring Service	\$3,438,294	2/23/99	3/5/99	54	4
25/ "Closed" Broadcast Auction	\$57,820,350	9/28/99	10/8/99	35	91
	\$172,250	10/6/99	10/8/99	15	1
	\$1,210,000	3/21/00	3/24/00	26	2
26 929 and 931 MHz Paging Service	\$4,122,500	2/24/00	3/2/00	28	78
30 39 GHz	\$410,649,085	4/12/00	5/8/00	73	29
33/ 700 MHz Guard Band	\$519,892,575	9/6/00	9/21/00	66	9
	\$20,961,500	2/13/01	2/21/01	38	3
34 SMR 800 MHz General Category	\$319,451,810	8/16/00	9/1/00	76	14
35 PCS C & F Block	\$16,857,046,150	12/12/00	1/26/01	101	35
36 SMR 800 MHz Lower 80 Channels	\$28,978,385	11/1/00	12/5/00	151	22

Source: Federal Communications Commission

Notes:

(1) Total Winning Bids includes high bids from the auction (net of any bidding credits) plus the price paid for any pioneer preference licenses.

(2) C block broadband PCS was auctioned in three auctions. Please note that because licenses are in more than one auction, simply summing together the figures for Total Winning Bids, Bid Price, and Number of Winning Bidders will result in over counting.

(3) DEF block broadband PCS was auctioned in two auctions. Please note that because licenses are in more than one auction, simply summing together the figures for Total Winning Bids, Bid Price, and Number of Winning Bidders will result in over counting.

Table 2: 700 MHz Guard Band Auction #33 Results

Bidder Name	Total High Bids	POPs	Net High Bids (1)
Nextel Spectrum Acquisition Corp.	37	226,892,282	\$337,862,000
Pegasus Guard Band, LLC	31	147,056,258	\$91,498,300
Access Spectrum, LLC	19	93,171,133	\$69,065,775
PTPMS II Communications, L.L.C.	3	6,377,407	\$6,279,000
Black Rock Partners, LP	2	5,787,033	\$2,547,750
Dominion 700, Inc.	1	7,745,433	\$6,320,000
Motorola Spectrum, Inc.	1	4,310,367	\$6,235,000
Harbor Wireless LLC	1	550,043	\$42,750
Radiofone Nationwide PCS, L.L.C.	1	0	\$42,000

Source: Federal Communications Commission

Notes: (1) As of the close of the auction.

Table 3: SMR 800 MHz General Category Auction #34 Results

Bidder Name	Total High Bids	POPs	Net High Bids (1)
Nextel Spectrum Acquisition Corp.	800	1,260,351,563	\$231,567,200
Southern Communications Services, Inc	89	90,834,191	\$50,855,000
Preferred Acquisitions Inc	38	81,157,644	\$31,670,600
Nevada Wireless LLC	37	17,066,215	\$774,020
Motient Communications Company	33	28,406,946	\$3,361,300
Silver Palm Communications, Inc.	10	6,373,807	\$393,000
A.R.C., Inc.	6	5,051,115	\$487,500
Communications Equipment, Inc.	6	3,370,315	\$56,420
Western Communications, Inc.	3	640,391	\$75,985
Choice Phone LLC	2	352,994	\$106,600
Mobile Relay Associates	2	2,315,083	\$26,250
Winsome Paging Inc.	2	1,101,512	\$7,800
Communication Specialists Inc.	1	176,497	\$64,350
Linda Sue and Herschel Bruce Williamson	1	285,955	\$5,785

Source: Federal Communications Commission

Notes: (1) As of the close of the auction.

Table 4: PCS C & F Block Auction #35 Results

Bidder Name	Total High Bids	POPs	Net High Bids (1)
Cellco Partnership, d/b/a Verizon Wireless	113	150,682,267	\$8,781,393,000
Alaska Native Wireless, L.L.C.	44	64,718,725	\$2,893,144,250
Salmon PCS, LLC	79	71,921,921	\$2,348,774,750
DCC PCS, Inc.	14	17,709,151	\$546,074,000
Cook Inlet/VS GSM V PCS, LLC	22	17,685,514	\$506,376,000
VoiceStream PCS BTA I License Corporation	19	11,304,761	\$482,653,000
Leap Wireless International, Inc.	22	20,025,113	\$350,060,750
Black Crow Wireless, LP	17	10,185,736	\$283,885,000
SVC BidCo, LP	5	8,339,270	\$281,944,000
Lafayette Communications Company L.L.C.	14	6,141,572	\$170,340,150
NORTHCOAST COMMUNICATIONS, L.L.C.	11	6,292,576	\$112,705,000
Summit Wireless, LLC	13	1,962,700	\$34,992,250
3DL Wireless, LLC	3	1,701,084	\$15,597,000
TPS Utilicom, Inc.	4	1,097,971	\$13,817,000
MCG PCS II, Inc.	3	1,310,634	\$7,378,000
Unbound PCS, LLC	1	816,101	\$6,952,000
Theta Communications, LLC	1	260,538	\$4,017,000
NTCH, Inc.	7	1,104,500	\$2,591,250
LastWave Partners	1	424,766	\$1,864,000
SLO Cellular, Inc.	1	247,523	\$1,563,000
VINCENT D. McBRIDE	1	504,859	\$1,534,000
Purchase Communications	2	434,164	\$1,522,000
3G PCS, LLC	3	364,024	\$1,270,000
Mint GSM Services Inc.	2	325,532	\$1,053,500
Scott Reiter	4	362,871	\$971,250
Commnet PCS, Inc.	2	246,369	\$899,250
DEVTEL, LLC	2	332,618	\$768,000
Polycell Communications, Inc.	2	332,618	\$730,500
Poplar PCS-Central, LLC	2	282,260	\$600,750
Global Telecommunications, Inc.	2	176,000	\$369,750
Coloma Spectrum, LLC	2	173,872	\$338,250
ALPINE PCS, INC.	1	118,558	\$323,000
T.K.O. Communications, LLC	1	52,677	\$281,250
PCS Partners, L.P.	1	123,121	\$144,750
Citifone PCS, LLC	1	67,165	\$118,500

Source: Federal Communications Commission

Notes: (1) As of the close of the auction.

Table 5: SMR 800 MHz Lower 80 Channels Auction #36 Results

Bidder Name	Total High Bids	POPs	Net High Bids (1)
Nextel Spectrum Acquisition Corp.	2579	3,794,345,853	\$27,149,100
Southern Communications Services, Inc	90	75,489,735	\$817,500
Nevada Wireless	29	32,479,461	\$95,485
A.R.C., Inc.	21	20,965,725	\$303,745
Silver Palm Communications, Inc.	14	10,817,023	\$53,625
NextMobile Inc.	13	59,724,080	\$130,845
Skitronics, Inc.	8	6,591,930	\$90,610
L.P. Ganacias Enterprises, Inc.	8	1,411,976	\$5,395
Scott C. MacIntyre	7	16,772,902	\$223,860
Western Communications, Inc.	6	1,822,969	\$4,745
TOTAL COM INC.	4	4,594,811	\$24,505
GALESBURG COMMUNICATIONS, INC.	4	2,143,952	\$2,665
SR Communications Associates DBA COMMUNICATIONS AS	3	1,658,569	\$1,950
Reisenweaver Communications, Inc.	2	3,208,646	\$49,500
Gateway Wireless Services, L.C.	2	2,188,426	\$2,470
Motient Communications Company	2	2,049,563	\$4,800
CENTRE COMMUNICATIONS, INC	2	1,597,652	\$1,495
Ragan Communications, Inc.	2	1,047,438	\$13,000
Michael A. Wolf dba W S Electronics	1	1,125,936	\$715
UNITED COMMUNICATIONS CO.	1	499,681	\$845
Redi-Call Communications Company	1	290,800	\$780
Valley Cable & Satellite Communications, Inc.	1	84,696	\$750

Source: Federal Communications Commission

Notes: (1) As of the close of the auction.

Table 6: 700 MHz Guard Band Auction #38 Results

Bidder Name	Total High Bids	POPs	Net High Bids (1)
Access Spectrum, LLC	2	3,947,695.00	\$9,271,500
Nextel Spectrum Acquisition Corp.	3	4,904,414.00	\$7,849,000
Pegasus Guard Band, LLC	3	4,371,373.00	\$3,841,000

Source: Federal Communications Commission

Notes: (1) As of the close of the auction.

APPENDIX C: MOBILE TELEPHONY

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Table 1: CTIA's Semi-Annual Mobile Telephone Industry Survey

Date	Estimated Subscribers	Total Six- Month Service Revenues (000s)	Roamer Services Revenues	Cell Sites	Employees	Cumulative Capital Investment (000s)	Average Local Monthly Bill
Jan 85	91,600	\$178,085		346	1,404	\$354,760	
June 85	203,600	\$176,231		599	1,697	\$588,751	
Dec 85	340,213	\$306,197		913	2,727	\$911,167	
June 86	500,000	\$360,585		1,194	3,556	\$1,140,163	
Dec 86	681,825	\$462,467		1,531	4,334	\$1,436,753	
June 87	883,778	\$479,514		1,732	5,656	\$1,724,348	
Dec 87	1,230,855	\$672,005		2,305	7,147	\$2,234,635	\$96.83
June 88	1,608,697	\$886,075		2,789	9,154	\$2,589,589	\$95.00
Dec 88	2,069,441	\$1,073,473	\$89,331	3,209	11,400	\$3,274,105	\$98.02
June 89	2,691,793	\$1,406,463	\$121,368	3,577	13,719	\$3,675,473	\$85.52
Dec 89	3,508,944	\$1,934,132	\$173,199	4,169	15,927	\$4,480,141	\$83.94
June 90	4,368,686	\$2,126,362	\$192,350	4,768	18,973	\$5,211,765	\$83.94
Dec 90	5,283,055	\$2,422,458	\$263,660	5,616	21,382	\$6,281,596	\$80.90
June 91	6,380,053	\$2,653,505	\$302,329	6,685	25,545	\$7,429,739	\$74.56
Dec 91	7,557,148	\$3,055,017	\$401,325	7,847	26,327	\$8,671,544	\$72.74
June 92	8,892,535	\$3,633,285	\$436,725	8,901	30,595	\$9,276,139	\$68.51
Dec 92	11,032,753	\$4,189,441	\$537,146	10,307	34,348	\$11,262,070	\$68.68
June 93	13,067,318	\$4,819,259	\$587,347	11,551	36,501	\$12,775,967	\$67.31
Dec 93	16,009,461	\$6,072,906	\$774,266	12,805	39,775	\$13,946,406	\$61.48
June 94	19,283,306	\$6,519,030	\$778,116	14,740	45,606	\$16,107,920	\$58.65
Dec 94	24,134,421	\$7,710,890	\$1,052,666	17,920	53,902	\$18,938,677	\$56.21
June 95	28,154,415	\$8,740,352	\$1,120,337	19,833	60,624	\$21,709,286	\$52.45
Dec 95	33,785,661	\$10,331,614	\$1,422,233	22,663	68,165	\$24,080,466	\$51.00
June 96	38,195,466	\$11,194,247	\$1,314,943	24,802	73,365	\$26,707,046	\$48.84
Dec 96	44,042,992	\$12,440,724	\$1,465,992	30,045	84,161	\$32,573,522	\$47.70
June 97	48,705,553	\$13,134,551	\$1,392,440	38,650	97,039	\$37,454,294	\$43.86
Dec 97	55,312,293	\$14,351,082	\$1,581,765	51,600	109,387	\$46,057,911	\$42.78
June 98	60,831,431	\$15,286,660	\$1,584,891	57,674	113,111	\$50,178,812	\$39.88
Dec 98	69,209,321	\$17,846,515	\$1,915,578	65,887	134,754	\$60,542,774	\$39.43
June 99	76,284,753	\$19,368,304	\$1,922,416	74,157	141,929	\$66,782,827	\$40.24
Dec 99	86,047,003	\$20,650,185	\$2,163,001	81,698	155,817	\$71,264,865	\$41.24
June 00	97,035,925	\$24,645,365	\$1,971,625	95,733	159,645	\$76,652,358	\$45.15
Dec 00	109,478,031	\$27,820,655	\$1,911,356	104,288	184,449	\$89,624,387	\$45.27

Source: Cellular Telecommunications and Internet Association, *Semi-Annual Mobile Telephone Industry Survey* <<http://www.wow-com.com/wirelessurvey/>>.

Table 2: FCC's Semi-Annual Local Telephone Competition Survey

Mobile Wireless Telephone Subscribers (as of Dec. 31, 2000)						
State	Dec 2000 Reporting Carriers 1/	Dec 2000 Percent Resold 2/	Subscribers Dec 1999	Subscribers June 2000	Subscribers Dec 2000	Percent Change Dec 99 – Dec 00
Alabama	9	1%	1,080,410	1,253,084	1,386,294	28%
Alaska	*	*	165,221	169,892	*	*
Arizona	11	7	1,125,321	1,624,668	1,829,695	63
Arkansas	5	2	719,919	715,467	743,928	3
California	10	5	8,544,941	12,283,369	12,649,508	48
Colorado	8	4	1,552,718	1,654,989	1,856,075	20
Connecticut	6	7	1,077,089	1,136,618	1,277,123	19
Delaware	6	0	270,848	275,219	371,014	37
District of Columbia	6	10	910,116	333,815	928,962	2
Florida	9	6	5,158,079	4,983,478	6,369,985	23
Georgia	11	6	2,538,983	2,687,238	2,739,000	8
Hawaii	7	0	288,425	454,364	524,291	82
Idaho	4	23	271,436	296,066	344,564	27
Illinois	10	10	3,922,482	4,309,660	5,143,767	31
Indiana	10	6	1,318,975	1,717,378	1,715,074	30
Iowa	7	62	774,773	975,629	832,106	7
Kansas	10	4	669,472	724,024	801,293	20
Kentucky	9	2	911,700	999,544	942,545	3
Louisiana	11	4	1,227,106	1,294,693	1,306,457	6
Maine	5	32	187,003	283,640	359,786	92
Maryland	7	6	1,473,494	2,013,058	1,894,251	29
Massachusetts	6	4	1,892,014	2,228,169	2,649,130	40
Michigan	11	9	3,512,813	3,423,535	3,488,826	-1
Minnesota	12	2	1,550,411	1,595,560	1,740,654	12
Mississippi	7	0	673,355	509,038	786,577	17
Missouri	8	8	1,855,452	1,848,775	1,767,411	-5
Montana	*	12	*	*	*	*
Nebraska	5	1	576,296	600,885	659,380	14
Nevada	6	3	750,335	825,163	684,752	-9
New Hampshire	8	35	280,508	309,263	387,264	38
New Jersey	6	2	2,289,181	2,750,024	3,575,130	56
New Mexico	5	41	363,827	395,111	443,343	22
New York	6	11	4,833,816	5,016,524	5,736,660	19
North Carolina	11	13	2,536,068	2,730,178	3,105,811	22
North Dakota	*	2	*	*	*	*
Ohio	11	6	3,237,786	3,278,960	3,987,192	23
Oklahoma	13	10	826,637	979,513	2,271,755	175
Oregon	8	11	914,848	1,082,425	1,201,207	31
Pennsylvania	10	6	2,767,474	3,850,372	4,014,894	45
Puerto Rico	4	27	*	1,090,005	926,448	*
Rhode Island	6	39	279,304	313,550	355,889	27
South Carolina	9	7	1,137,232	1,236,338	1,392,586	22
South Dakota	*	3	*	*	*	*
Tennessee	10	11	1,529,054	1,876,444	1,962,568	28
Texas	19	8	5,792,453	6,705,423	7,489,180	29
Utah	8	5	643,824	692,006	750,244	17
Vermont	*	13	*	*	*	*
Virgin Islands	0	NA	*	0	0	NA
Virginia	12	8	1,860,262	2,447,687	2,450,289	32
Washington	9	8	1,873,475	2,144,767	2,286,082	22
West Virginia	6	25	241,265	347,916	355,989	48
Wisconsin	10	45	1,525,818	1,342,908	1,595,728	5
Wyoming	4	1	127,634	*	*	*
Nationwide	77	9%	79,696,083	90,643,058	101,212,054	27%

* Data withheld to maintain firm confidentiality.

1/ Carriers with under 10,000 subscribers in a state were not required to report for that state.

2/ Percentage of wireless lines resold to other wireless carriers.

Source: *Local Telephone Competition: Status as of December 31, 2000*, Federal Communications Commission, May 2001 (Table 9: Mobile Wireless Telephone Subscribers).

**Table 3: Top 25 Mobile Telephone Operators by Subscribers
(in thousands)**

Year-End 1999		<i>Pro Forma</i> Year-End 1999		Year-End 2000	
Operator	Total	Operator	Total	Operator	Total
1 SBC	11,151	Verizon Wireless (3)	25,790	Verizon Wireless	27,505
2 AT&T Wireless	9,600	SBC-BellSouth	16,488	Cingular	19,681
3 Vodafone-AirT	9,133	AT&T Wireless	9,987	AT&T	15,163
4 Bell Atlantic	7,688	Sprint PCS	5,727	Sprint PCS	9,543
5 GTE	7,146	ALLTEL	5,019	Nextel	6,678
6 Sprint PCS	5,727	Nextel	4,516	ALLTEL	6,300
7 BellSouth	5,337	US Cellular	2,602	VoiceStream	3,879
8 ALLTEL	5,019	VoiceStream	2,204	US Cellular	3,061
9 Nextel	4,516	Western Wireless	835	Western Wireless	1,050
10 US Cellular	2,602	CenturyTel	707	Powertel	908
11 PrimeCo	1,400	Dobson Comm.	660	Qwest	805
12 Omnipoint	935	Powertel	546	CenturyTel	751
13 VoiceStream	846	Centennial	503	TeleCorp	666
14 Western Wirless	835	US West	466	Dobson Comm.	654
15 CenturyTel	707	Rural Cellular	466	Rural Cellular	552
16 Powertel	546	Price Comm.	454	Price Comm	528
17 Centennial	503	PR Tel. Co. (1)	254	Centennial	665
18 US West	466	Triton PCS	195	Triton PCS	446
19 Dobson Comm.	445	Cincinnati Bell	162	Cincinnati Bell	339
20 American	431	Midwest Wireless	150	PR Tel. Co.	335
21 Price Comm.	454	TeleCorp	142	Nextel Partners	227
22 Aerial	423	Cellcom (NE Comm. of WI.)	130	Midwest Wireless	208
23 CommNet	423	US Unwired	93	Cellcom	190
24 PR Tel. Co. (1)	254	Bluegrass Cellular	75	Leap Wireless	190
25 Rural Cellular	242	PCS One (2)	50	Ntelos	168

Sources: For 1999, see *Fifth Report*, at 17749. For 2000, except for Cellcom and Midwest Wireless, publicly available company documents such as operators' news releases and filings made with the Securities and Exchange Commission. For 2000, Cellcom and Midwest Wireless results are from *Cellular Carriers*, RCR WIRELESS, Mar. 5, 2001.

Notes:

- (1) Puerto Rico Telephone Co. Inc.'s subscribers are as of June 30, 1999.
- (2) PCS One is a joint venture between a subsidiary of VoiceStream and D&E Communications, Inc.
- (3) In Verizon's 2000 10-K, the company reported 1999 *Pro Forma* subscribers as 23,791,000.

**Table 4: Estimated Mobile Telephone Rollouts
by Number of Launches by County**

Total Number of Providers in a County	Number of Counties	POPs Contained in Those Counties (1)	% of Total US POPs	Square Miles Contained in Those Counties	% of Total US Square Miles
3 or More	1812	259,008,748	90.8%	1,420,596	40.3%
4 or More	1273	240,652,202	84.4%	960,596	27.3%
5 or More	906	214,143,935	75.1%	676,621	19.2%
6 or More	485	133,133,133	46.7%	364,547	10.4%
7 or More	138	33,845,568	11.9%	112,353	3.2%

**Table 5: County Quartiles with Estimated Rollout by at least 3 Mobile
Telephone Providers**

County Quartile Based on Population	Total Number of Counties (2)	Number of Counties with at least 3 Providers	Percent of Counties in Quartile with at least 3 Providers	POPs in Those Counties (1)	Percent of Quartile POPs with at least 3 Providers
1st Quartile	805	750	93.2%	229,657,015	97.9%
2nd Quartile	805	530	65.8%	21,118,979	67.2%
3rd Quartile	805	387	48.1%	7,099,963	50.2%
4th Quartile	804	145	18.0%	1,132,791	22.6%

Source: Federal Communications Commission estimates based on publicly available information.

Notes:

- (1) POPs from the 2000 Census.
- (2) United States and Puerto Rico

Table 6: Estimated U.S. Digital Mobile Telephone Subscribers

Technology	1997 Subscribers	1998 Subscribers	97/98 Percent Change	1999 Subscribers	98/99 Percent Change	2000 Subscribers	99/00 Percent Change	Percent of Total Digital Subs
GSM Subs	1,200,000	2,700,000	125%	5,200,000	93%	7,900,000	52%	12%
TDMA Subs	3,800,000	8,700,000	129%	18,000,000	107%	25,900,000	44%	38%
CDMA Subs	1,400,000	6,400,000	357%	15,600,000	144%	26,800,000	72%	40%
iDEN Subs	1,300,000	2,900,000	123%	4,800,000	66%	7,100,000	48%	10%
Total Digital Subs	7,700,000	20,700,000	169%	43,600,000	111%	67,700,000	55%	
Percent of Total	14%	30%	115%	51%	69%	62%	22%	
Analog Cellular Subs	47,600,000	48,500,000	2%	42,400,000	-13%	41,800,000	-1%	
Percent of Total	86%	70%	-19%	49%	-30%	38%	-23%	
Total Mobile Phone Subs (1)	55,300,000	69,200,000	25%	86,000,000	24%	109,500,000	27%	

Sources:

CDMA: 1997-1999 – *Fifth Report*, at 17752. 2000 - CDMA Development Group, *CDMA Worldwide Subscribers* (visited May 17, 2001) <http://www.cdg.org/world/cdma_world_subscriber.asp>. The figure was reported for North America as a whole and was adjusted for the United States by removing the estimated Canadian CDMA subscriber of BCE Mobile Communications, Inc., Telus Corp., and Aliant Inc.

TDMA: 1997-1999 – *Fifth Report*, at 17752. 2000 - Conversation with Ben Harvey, Director for North America & Membership, Universal Wireless Communications Consortium, Mar. 2001. The figure was reported for North America as a whole and was adjusted for the United States by removing the estimated TDMA subscriber of Rogers Cantel Mobile Communications, Inc. and American Movil, S.A. de C.V.'s Mexican wireless unit, Telcel.

GSM: 1997-1999 – *Fifth Report*, at 17752. 2000 - *GSM North American Customers Top 10 Million Mark*, News Release, GSM North American, Mar. 27, 2001. The figure was reported for North America as a whole and was adjusted for the United States by removing the estimated GSM subscribers of Microcell Telecommunications, Inc.

iDEN: 1997-1999 – *Fifth Report*, at 17752. 2000 - The iDEN figures are the combined estimated digital SMR subscribers for Nextel, Nextel Partners, Southern LINC, and Pacific Wireless Technologies, Inc.

Notes:

(1) Total Mobile Phone Subs: Appendix C, Table 1, at C-2.

Table 7: Mobile Telephone Digital Coverage

Technology	POPs in Those Areas (1)	% of Total POPs (2)	Square Miles Contained in Those Counties	% of Total Square Miles
TDMA	237,706,818	83.3%	1,471,170.0	41.8%
CDMA	241,997,667	84.8%	1,236,939.5	35.1%
GSM	196,851,329	69.0%	787,255.0	22.4%
iDEN	231,573,819	81.2%	960,801.2	27.3%
Total Digital	271,077,680	95.0%	2,015,882.7	57.2%

Source: Federal Communications Commission estimates based on publicly available information.

Notes:

- (1) Broadband PCS and digital SMR licensees are analyzed by county; cellular licensees are analyzed by cellular market areas ("CMAs").
 (2) POPs from the 2000 Census.

Table 8: Change in CPI

	CPI		Cellular CPI		All Telephone CPI		Local Telephone CPI		Long Distance Telephone CPI	
	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change
Dec-97	100		100		100		100		100	
Dec-98	101.6	1.6%	91.7	-8.3%	100.3	0.3%	101.3	1.3%	99.9	-0.1%
Dec-99	104.3	2.7%	81.1	-11.6%	100.7	0.4%	104.2	2.8%	98.6	-1.3%
Dec-00	107.9	3.4%	71.1	-12.3%	98.4	-2.3%	110.0	5.5%	89.5	-9.2%
Dec-97 to Dec-00		7.9%		-28.9%		-1.6%		10.0%		-10.5%

Source: Bureau of Labor Statistics

Table 9: Top 20 Mobile Telephone Resellers: 1999 - 2000

1999		2000	
Operator	Resale Subscribers	Operator	Resale Subscribers
MCI WorldCom	950,000	MCI WorldCom	2,000,000
Progressive Concepts	77,500	PageTel Wireless	185,000
CellNet Communications	55,000	Areawide Cellular	118,000
Discount Cellular Inc.	46,079	Page Plus Cellular	100,000
Prime Matrix Wireless	46,000	Direct Communications	93,000
DCN Wireless/Robo Wireless	41,896	AirPage	80,146
Select Wireless	40,000	Progressive Concepts	80,000
Anything Wireless	28,000	Locus Telecommunications	75,000
Fox Communications	26,000	Cellnet Communications	53,000
Cellular Plus Systems	23,000	DCN Wireless	41,775
Marathon Communications	20,000	PreCell Cellular	40,000
Cellnet of Ohio Inc.	17,650	Discount Cellular	36,546
SkyNet	17,609	Consumer Cellular	25,000
Car Phones Express	14,863	Page Express	24,182
The Mobile Phone Co.	11,500	Cellular Plus Systems, Inc	20,000
Pacific Cellular	10,500	Car Phones Express Inc.	20,000
San Diego Wireless	10,162	SkyNet	16,846
Apex Wireless	8,500	Cellnet of Ohio Inc.	16,750
Personal Cellular Service	3,700	Aircell Communications	15,000
Phase 2 Cellular	3,500	Central Cellular	15,000
Total	1,451,459		3,055,245
MCI WorldCom's Percentage of top 20	65.5%		65.5%

Sources:

1999: *RCR Top 20 Resellers*, RCR RADIO COMMUNICATIONS, Jan. 10, 2000, at 16.2000: *RCR Top 20 Resellers*, RCR WIRELESS NEWS, Jan. 8, 2001, at 18.

Note:

Resellers are defined as those companies that do not own a mobile phone network or license and resell wireless airtime from a licenses carriers' mobile switching center

**Table 10: U.S. Mobile Telephone Operators'
Holdings in Foreign Mobile Operators**

Operator	Country	Subscribers (Brand name)	Venture	Ownership (%)
SBC	France	9.319 million	Cegetel (owns 80% of cellular company Societe Francaise de Radiotelephone)	15 (through JV with Vivendi)
	Denmark	1.741 million	Tele Danmark	41.6
	Belgium	3.062 million (Proximus)	Belgacom	17.5 (controls 24.36% through investment in Tele Danmark, which owns 16.5% of Belgacom)
	South Africa	3.619 million (Vodacom)	Telkom SA(owns 50% of Vodacom)	18
	Canada	2.22 million (Bell Mobility)	Bell Canada	20
	Mexico	9.775 million (Telcel)	Telmex	8.5
	Taiwan	605,000	TransAsia Telecommunications	19.4
	Brazil	1.450 million	Algar Telecom Leste S.A.	25 (through Telecom Americas consortium with Bell Canada International and Telmex)
	Brazil (Sao Paulo state)	940,000	Tess S.A.	62 (through Telecom Americas consortium with Bell Canada International and Telmex)
BellSouth	Uruguay	126,748 (Movicom)	Abiatar	46
	Guatemala	Mid-2000 Launch	BellSouth Guatemala	60
	Nicaragua	90,294	Nicacell	89
	Ecuador	225,180	Otecel	89.4
	Panama	205,564	BellSouth Panama	43.7
	Brazil (Sao Paulo)	3,708,090	BCP/BSE	46
	Brazil (northeast)		Tele Centro Oeste Celular	17.3
	Brazil (central western & northern regions)			
	Venezuela	3,234,972	Telcel	78.2
	Argentina	1,606,704	Movicom/BellSouth	65
	Chile	690,720	BellSouth Chile	100
	Columbia	859,366	Celumovil	66
	Peru	361,367	Tele 2000	96.8
	Germany	6,068,224	E-Plus	22.5 (shares equal control of E-Plus with KPN through ownership in BellSouth GmbH)
	Denmark	810,251	Sonofon	46.5
	Israel	1,856,488	Cellcom	34.7
	India	36,899	SkyCell Communications	50
AT&T	Canada	3 million	Rogers Cantel	17
	India	176,800	Birla Communications Ltd.	49
	Taiwan	3.211 million	FarEasTone	14
	Czech Republic	2.11 million	EuroTel Praha	24.5
	Slovakia	493,030	EuroTel Bratislava	24.5
C-9				

	India	606,200 (BPL Mobile)	BPL Cellular	49	
Verizon	Italy	15 million	Omnitel Pronto Italia	23.1	
	Mexico	1.7 million	Iusacell	37.2	
	Czech Republic	2.11 million	EuroTel Praha	24.5	
	Slovakia	493,030	EuroTel Bratislava	24.5	
	Greece	1.645 million	STET Hellas	20	
	Indonesia	765,000	Excelcomindo	23.1	
	Japan	3.84 million	Tu-Ka	2.7-5	
	New Zealand	1.2 million	Telecom New Zealand	24.9	
	Philippines	26,000 (Extelcom)	BayanTel (owns 46.6% stake in wireless provider Extelcom)	19.4	
	Argentina	950,000 (CTI Movil)	CTI Holdings	59.5	
	Canada	2.156 million	TELUS Corporation	22	
	Venezuela	1.7 million	CANTV	28.5	
	Taiwan	5.1 million	Taiwan Cellular Corporation	13.5	
	Dominican Republic	393,000	CODETEL	100	
Leap Wireless International	Mexico	536,000	Pegaso PCS	20.1	
Sprint PCS	Mexico	536,000	Pegaso PCS	25	
Western Wireless International	Ireland	678,000 for all foreign ventures	Launched 2/01	Meteor	78
	Iceland		55,000	TAL	57.3
	Slovenia		Licensed 11/00	Western Wireless	100
	Croatia		470,000	VIPnet	19
	Georgia		NA	MagtiCom	14.5
	Ghana		NA	Western Telesystems	56.7
	Cote d'Ivoire		Launched 9/00	CORA de Comstar	40
	Bolivia		Launched 11/00	NuevaTel	67
	Haiti		NA	COMCEL	51
Nextel International	Canada	2.156 million	TELUS Corp.	4.8	
	Japan	49,000	NEXNET Co.	32	
	Argentina	134,000	Nextel Communications Argentina	100	
	Brazil	322,000	Nextel Telecomunicacoes	100	
	Mexico	218,000	Nextel De Mexico	100	
	Peru	68,000	Nextel del Peru	100	
	Philippines	42,000	Nextel Communications Philippines, Inc.	51	

Sources: Publicly available information such as operators' news releases, web sites and filings with the Securities and Exchange Commission, the web site of the European Radiocommunications Office, and the following sources: Cellular Telephone Subscribers by Network, ASIACOM, Mar. 6, 2001, at 7-10; David Luhnow, *Telefonica Unit in Talks to Buy Mexican Stake*, THE WALL STREET JOURNAL, May 14, 2001, at 13 and 16.

APPENDIX D: MOBILE DATA

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Table 1: Contracts in the United States

<u>Hardware Company</u>	<u>Carrier Company</u>	<u>Announcement</u>	<u>Value</u>	<u>Summary</u>
Ericsson	Pacific Bell Wireless	February 2000	N/A	Pacific Bell has selected Ericsson to provide GPRS technology on its existing network.
	VoiceStream	May 2000	\$350 Million	Ericsson will provide GPRS and WAP network infrastructure equipment and handsets.
	BellSouth	May 2000	\$750 Million	Ericsson will upgrade BellSouth's networks so they are ready for migration to 3G.
	AT&T Wireless	November 2000	N/A	Ericsson will provide AT&T Wireless network equipment and mobile phones for its GPRS network.
Lucent	AT&T Wireless	November 2000	N/A	GSM with GPRS base stations; AT&T Wireless selected Lucent as its major 3G equipment provider.
	Verizon Wireless	March 2001	\$5 Billion	Lucent will provide Verizon Wireless products, services and software for its cdma2000 3G1XRTT network.
	Nextel	March 2001	N/A	Lucent will provide high-speed network switches for Nextel's iDEN network.
Motorola	Sprint PCS	January 2001	N/A	Motorola will provide Sprint with cdma2000 network upgrades to 1x packet data capability.
Nokia	AT&T Wireless	November 2000	N/A	Nokia will provide AT&T Wireless GPRS, triple-mode base station radio solutions.
Nortel	AT&T Wireless	November 2000	N/A	Nortel will supply AT&T Wireless with 3G infrastructure equipment.

Source: The information provided above is illustrative of technology contracts and should not be considered an exhaustive list. Information is based on publicly available documents such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

Table 2: Tests/Trials in the United States

<u>Hardware Company</u>	<u>Carrier Company</u>	<u>Announcement</u>	<u>Summary</u>
Nortel Networks	AT&T Wireless	June 2000	Nortel and AT&T Wireless will conduct non-commercial trials of GPRS.
	Verizon Wireless	November 2000	Nortel and Verizon Wireless completed trial of cdma2000 high-speed data and voice transmissions.
Lucent	Symmetry Communication s Systems	January 2000	Symmetry and Lucent have agreed to collaborate on interoperability testing of 2.5G wireless network elements.
	QUALCOMM	April 2000	The companies have collaborated on 3G wireless data technology, resulting in the first live transmissions of over-the-air data using cdma2000-1x technology.
	Sprint PCS	June 2000	Will test 1x Evolution (1xEV) technology which is based on HDR and incorporates 1xRTT.
	Verizon Wireless	July 2000	Verizon and Lucent completed a wireless data transmission at ten times faster than current CDMA transmission speeds. The wireless transmission was complete via a 3G network installed by Lucent.
	Verizon Wireless	November 2000	Lucent and Verizon will trial cdma2000 1xEV for 3G mobile data services.
	Sprint	April 2001	Lucent and Sprint complete a trial of the fastest 3G data call at a speed up to 2.4 Mbps. The test was completed using CDMA2000 1xEV-DO technology. Testing will continue through June 2001.
Motorola	N/A	February 2000	The company announced the successful completion of a voice over Internet protocol (VoIP) call on top of a 3G high-speed packet data call at 384 Kbps.
	Sprint PCS	March 2001	Sprint PCS will work with Motorola to conduct Java 2 Platform, Micro Edition (J2ME) lab trials. J2ME may be used to deliver applications to customers over 3G networks.
QUALCOMM	Sprint PCS & Samsung Telecommunicat ions America	March 2000	The companies announced that they have successfully completed the first voice call by a carrier using 3G CDMA 1x technology in North America.
	Sprint PCS	May 2000	The companies announced U.S. trials of a 3G CDMA 1x Multi-Carrier (MC) voice and data solutions began in April 2000.

Sources: The information provided above is illustrative of tests and trials and should not be considered an exhaustive list. Information is based on publicly available documents such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

Table 3: 3G Licensing Abroad

Country (status)	Spectrum (MHz)	Number of Licenses	Assignment Method	Auction Revenue Or License Fee	
				Foreign Currency	US Dollars
Austria (Awarded November 2000)	145	4-6 (6 awarded)	Auction (with pre-qualification based on assessment of technical & economic abilities)	ATS 11.443 billion	\$714 million
Australia (Awarded March 2001)	140 in capital cities	4 or more (6 awarded)	Auction	\$1.170 billion	\$575 million
	110 in Canberra	3 or more (5 awarded)			
	40 in regional areas	2 or more (3 awarded)			
Belgium (Awarded March 2001)	140 (105 sold)	4 (3 awarded)	Auction	Euros 450.2 million	\$419 million
Denmark (Scheduled for October 2001)	140	4	Auction	To be determined	
Finland (Awarded March 1999)	140	4	Beauty contest	No charge for license – Annual spectrum fee of Euros 1000 per 25 KHz	Annual spectrum fee of \$890 per 25 KHz
France (2 awarded May 2001)	140	4 (2 bids received)	Beauty contest with entrance fee	FFr 32.5 billion per license	\$4.74 billion per license
Germany (Awarded August 2000)	145	4-6 (6 awarded)	Auction	99.368 billion DM	\$46.214 billion
Greece (Expected July 2001)	140	4	Auction	To be determined	
Hong Kong (Expected mid-2001)	140	4	Combination (pre-qualification followed by auction)	Royalty percentage of service revenue to be determined by auction	
Italy (Awarded October 2000)	145 (145 MHz auctioned & 20 MHz sold at fixed price to two winning entrants)	5	Combination (pre-qualification beauty contest followed by competitive bids)	L 23.55 billion	\$10.084 billion

Ireland (Expected May-June 2001)	140	4	Beauty contest	To be determined	
Japan (Awarded July 2000)	120	3	Beauty contest	Not available	
Netherlands (Awarded July 2000)	145	5	Auction	Fl 5.918 billion	\$2.515 billion
Norway (Awarded November 2000)	140	4	Beauty contest	Kr 400 million + annual fee of Kr 20 million per license	\$43 million + annual fee of \$2.2 million per license
Portugal (Awarded November 2000)	140	4	Beauty contest	80 billion Escudos + annual license fee	\$357 million + annual license fee
Singapore (Originally scheduled for April 2001)	140	4	Auction (may not take place given only 4 bidders)	To be determined	
South Korea (2 awarded December 2000; 1 more expected May 2001)	Not available	3 (2 awarded)	Beauty contest	Not available	
Spain (Awarded March 2000)	140	4	Beauty contest	Euros 520 million + annual fee of Euros 150 million per license	\$462.8 million + annual fee of \$133.5 million per license
Sweden (Awarded December 2000)	140	4	Beauty contest	SKr 400,000 + annual fee of 0.15% of turnover	\$44,000 + annual fee of 0.15% of turnover
Switzerland (Awarded December 2000)	140	4	Auction	CHF 205 million	\$120 million
Taiwan (Expected December 2001)	170	5	Combination (pre-qualification followed by auction)	To be determined	
UK (Awarded April 2000)	140	5	Auction	£22.4774 billion	\$35.411 billion

Sources: Publicly available information such as web sites of national regulatory authorities, the EU Commission, and the ITU.

Table 4: Mobile Internet Access Services

ISP	Price per month	Notes
ALLTEL	Free with select Total Freedom rate plans \$5.95 with select digital rate plans	Users can customize their wireless web home pages to include pertinent information and tools, such as a list of bookmarks.
AT&T Wireless	Free with AT&T Wireless calling plan \$6.99 to \$14.99 for additional services	Basic free service includes access to over 80 web sites. Plus and Premium plans include access to all web sites, email, calendar, contact list, and other features.
Cingular Wireless	\$6.99	Available in 13 cities. Provides content such as movie listings, stock quotes, news, weather and yellow pages.
Earthlink	\$79.95 unlimited Ricochet service	Service available on Ricochet devices in 3 Ricochet cities: Atlanta, Phoenix, and San Diego.
GoAmerica	\$9.95 for 25k \$59.95 unlimited \$74.95 unlimited Ricochet services	Available to users of several different devices. Includes access to a Go.Web e-mail account or to an existing web-based e-mail account, and to nearly any web site that has been designed for mobile access. Users can customize content through a MyGo.Web portal.
Juno	\$79.95 unlimited Ricochet service	Service available on Ricochet devices in 15 cities served by Ricochet.
Nextel Online	From \$14.95	Partnered w/ MSN Mobile. Allows Internet access via Nextel phone or utilize phone as a modem for full web access.
OmniSky	\$39.95 unlimited	Available to users of several different devices. Includes access to an existing web-based or Microsoft Outlook e-mail account, and to a variety of web content that has been designed for mobile access. Users can customize content with My OmniSky.
Palm.Net	\$9.99 50 KB \$24.99 150 KB \$44.99 unlimited	Available to the Palm VII and VIIx. Includes mobile e-mail access to a Palm.Net account and access to over 580 web-clipped sites.
Ricochet	\$74.95 or \$75.95 unlimited 128 kbps service	Modem attachment provides mobile Internet access for laptops. Service available at 128 kbps in 13 cities (Atlanta, Baltimore, Dallas, Denver, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, Phoenix, San Diego, and San Francisco), and at 28 kbps in three cities (Seattle, Washington, D.C., and parts of San Francisco Bay Area) while it upgrades to 128 kbps.
Sprint PCS	From \$9.99 with Sprint PCS calling plan	Calling plan minutes can be used for either calls or Internet. Includes access to over 80 web sites.
Vaultus (formerly MobileLogic.web)	\$70.00	Wireless web access package, including software, wireless Internet airtime, wireless data modem, and technical support. MobileLogic.web software compresses and optimizes web pages to deliver a faster transmission over the wireless link.
Verizon Wireless	\$6.95	Allows users to customize content, either with a handset or through a wired PC at MyVZW.com, Verizon's portal.
VoiceStream	\$4.99	Allows limited Internet e-mail capacity and basic web info in the form of text messages for stock quotes, sports scores, etc. Powered by InfoStream (Infospace).
Wireless Web Connect	\$74.95 unlimited Ricochet service	Service available on Ricochet devices in 15 cities served by Ricochet.
WorldCom	\$79.95 unlimited Ricochet service	Service available in 8 Ricochet cities: Atlanta, Baltimore, Dallas, Houston, New York, Minneapolis-St. Paul, Phoenix, and San Diego.

Sources: The information provided above is illustrative of Internet access services provided by mobile telephone operators in 2000 and should not be considered an exhaustive list. Information is based on publicly available company documents such as news releases, company web sites, SEC filings, and newspaper and periodical articles.

Table 5: 1998 –2000 Paging/Messaging Industry Numbers

	<u>Paging/ Messaging Units</u>	<u>Percent Growth</u>	<u>Advanced Messaging Subscribers</u>	<u>Percent Growth</u>	<u>Advanced Messaging Revenues</u>	<u>Percent Growth</u>	<u>Average Monthly Revenue Per Unit</u>
1998	45,100,000	4.40%	500,000	150%	\$125,000,000	101%	\$28.85
1999	45,800,000	1.55%	700,000	40%	\$176,000,000	41%	\$23.62
2000	45,300,000	-1.09%	1,200,000	71%	\$257,000,000	46%	\$22.29

Source: THE STRATEGIS GROUP, U.S. PAGING SUBSCRIBERS AND REVENUES: 1995-2004 (2000).

Table 6: 1996 – 2000 Number of Paging/Messaging Units by Publicly-Held Company

Company	1996	growth	1997	growth	1998	growth	1999	growth	2000
Arch (1)	16,246,574	7.68%	17,494,743	-1.45%	17,240,908	-7.83%	15,891,000	-25.15%	11,894,000
Metrocall (2)	4,576,148	16.50%	5,331,177	6.16%	5,659,550	4.74%	5,927,939	5.51%	6,254,373
Vodafone AirTouch (3)	2,850,000	8.81%	3,101,000	10.35%	3,422,000	n/a	n/a	n/a	n/a
WebLink Wireless	1,851,445	35.75%	2,513,337	4.19%	2,618,527	1.70%	2,662,995	-16.70%	2,218,340
Ameritech (4)	1,140,000	31.58%	1,500,000	2.80%	1,542,000	n/a	n/a	n/a	n/a
SkyTel (5)	907,300	20.90%	1,096,900	29.62%	1,421,800	n/a	n/a	n/a	n/a
American Paging (6)	777,400	4.33%	811,100	n/a	n/a	n/a	n/a	n/a	n/a
Preferred Networks	362,481	25.47%	454,795	15.50%	525,274	0.07%	525,622	-14.39%	450,000
Teletouch (7)	195,500	64.25%	321,100	8.91%	349,700	12.73%	394,200	4.43%	411,700
Paging Partners (8)	83,000	81.93%	151,000	19.87%	181,000	n/a	n/a	n/a	n/a
Aquis Communications	n/a	n/a	n/a	n/a	n/a	n/a	375,000	-8.8%	342,000

Sources: Information is based on publicly available documents such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

Notes:

- (1) In June 1999, Arch completed its acquisition of MobileMedia. The Arch figures for 1996, 1997, and 1998 include MobileMedia subscribers. On November 10, 2000, Arch Wireless completed its merger with PageNet. The Arch figures for 1996, 1997, 1998, and 1999 include PageNet subscribers.
- (2) On December 30, 1997, Metrocall completed its acquisition of ProNet. The Metrocall figures for 1996 include ProNet subscribers. On October 2, 1998, Metrocall completed its acquisition of AT&T. Metrocall's figures for 1996 and 1997 include the AT&T subscribers.
- (3) Vodafone AirTouch does not report paging subscribers.
- (4) Ameritech was acquired by SBC in 1999, which does not report paging subscribers.
- (5) SkyTel was acquired by WorldCom, Inc. which does not report paging subscribers.
- (6) American Paging was acquired by TSR Wireless, LLC, a privately held company in 1998.
- (7) In September 2000, Teletouch acquired GTE's Texarkana paging operations. The Teletouch figures for 2000 include GTE's Texarkana subscribers.
- (8) Paging Partners was acquired by Aquis Communications on March 31, 1999.

TABLE 7: 1996 – 2000 REVENUES BY PUBLICLY-HELD COMPANY

Company	1996	growth	1997	growth	1998	growth	1999	growth	2000
Arch (1)	\$1,794,567	5.05%	\$1,885,209	1.28%	\$1,909,343	-14.55 %	\$1,631,547	-47.83%	\$851,082
Metrocall (2)	\$247,101	17.10%	\$289,364	60.60%	\$464,724	31.30%	\$610,187	-7.90%	\$561,983
Vodafone AirTouch (3)	\$343,000	7.58%	\$369,000	13.55%	\$419,000	n/a	n/a	n/a	n/a
WebLink Wireless	\$221,592	25.36%	\$277,778	12.19%	\$311,652	4.34%	\$325,165	-10.82%	\$289,976
SkyTel (4)	\$330,239	14.27%	\$377,366	28.87%	\$486,304	n/a	n/a	n/a	n/a
American Paging (5)	\$104,187	-9.38%	\$94,413	n/a	n/a	n/a	n/a	n/a	n/a
Preferred Networks	\$11,734	52.67%	\$17,914	9.23%	\$19,567	n/a	\$17,033	-17.19%	\$14,105
Teletouch (6)	\$31,725	30.46%	\$41,389	9.11%	\$45,159	13.24%	\$51,138	10.66%	\$56,591
Paging Partners (7)	\$6,910	31.24%	\$9,069	n/a	\$9,902	n/a	n/a	n/a	n/a
Aquis Communications	n/a	n/a	n/a	n/a	n/a	n/a	\$31,159	-7.95%	\$28,683

Sources: Information is based on publicly available documents such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

Notes:

- (1) The Arch figures are pro forma figures estimated to include MobileMedia's and PageNet's operations.
- (2) The Metrocall figures are pro forma figures estimated to include ProNet's operations. AT&T did not separately report paging figures.
- (3) Vodafone AirTouch does not report paging figures.
- (4) SkyTel was acquired by WorldCom, Inc. which does not report paging figures.
- (5) American Paging was acquired by TSR Wireless, LLC, a privately held company in 1998.
- (6) In September 2000, Teletouch acquired GTE's Texarkana paging operations. The Teletouch figures for 2000 include GTE's Texarkana subscribers.
- (7) Paging Partners was acquired by Aquis Communications on March 31, 1999.
- (8) On June 16, 2000, Aquis completed its acquisition of Suburban Connect and on February 1, 2000 the company completed its acquisition of SourceOne Paging. The Aquis figures for 2000 include Suburban Connect and SourceOne subscribers.

TABLE 8: ADVANCED MESSAGING SERVICES

ISP	Notes	Device	Cost	Monthly Cost
Arch	Offers mobile e-mail, customized profile to personalize messages, text messages up to 5,000 characters, and assured delivery where messages are stored for up to 96 hours when the unit is turned off or outside coverage areas. Also offers the ability to download wireless applications including flight updates, ATM and restaurant locations and maps.	Motorola T900, Motorola PageWriter 2000x	\$179.95	Arch Webster 100 \$14.95 to \$39.95
Cingular Interactive	Offers quick response time, interactive messaging. Special confirmation feature indicates messages are “delivered” and “read”. Able to retrieve and manage e-mail messages from different sources. Can use the same e-mail address for handheld as used for desktop PC. Offers access to wireless Web content including headlines, horoscopes and weather forecasts.	RIM 950	\$399	\$44.99
Motient	Offers the eLink wireless e-mail service. ELink lets users send and receive real-time e-mail messages from virtually anywhere in the United States. It also acts as an inbox, information manager, pager and calendar.	RIM 850	\$399	\$24.95 to \$59.95
Metrocall	Offers interactive messaging, and the ability to send and receive e-mail. The service can be integrated with desktop e-mail. Also, user can access and customize Internet content.	Motorola T900, RIM 850	\$149.95 \$399	\$29.95 to \$59.95
SkyTel	Ability to send and receive e-mail messages of up to 2,000 characters. Offers guaranteed delivery for storage up to 72 hours and nationwide coverage.	Motorola PF1500, Glenayre AccessMate,	\$135 \$150	SkyWord Plus \$29.95
		Glenayre AccessLink II, Motorola Timeport T935, Motorola Talkabout T900	\$195; \$399; \$180	SkyWriter \$24.95
		RIM 850	\$395	ELink \$59.95
WebLink Wireless	With WebLink Wireless service, users are able to send instant messages to other wireless devices or to send e-mail to any Internet address. Offers the ability to access Internet content including news, sports, and weather.	Motorola Talkabout T900; Timeport P935; PageWriter 2000x, Glenayre AccessLink II	\$99.95 \$499.95	\$19.95 to \$29.95
Verizon	Offers interactive messaging and access to Internet content including news, weather, stock reports, sports updates and more.	Motorola Talkabout T900	\$124.95	\$12.95 to \$29.95

Sources: Information is based on publicly available documents through the end of 2000 such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

Table 9: Handheld Devices with Mobile Internet Access

<u>Handheld/PDA</u>	<u>Manufacturer</u>	<u>Wireless Internet Connection</u>	<u>Price</u>
Casio E-125	Casio	Nextcell Pocket Spider Modem	\$549.99
Compaq iPAQ -series	Compaq	PC Card Expansion Pack and Sierra Wireless Aircard 300	\$599
Visor -series	Handspring	Novatel Minstrel S wireless modem, VisorPhone, or Glenayre @ctiveLink advanced messaging module	\$149-\$449
HP Jornada -series	Hewlett-Packard	Minstrel 540 wireless modem	\$499
Palm VII and VIIx	Palm	Built-In Wireless	\$399 (\$299)
Palm III and V	Palm	Mobile phone or Novatel Minstrel wireless modem	\$329-\$349
Palm m105	Palm	Mobile phone	\$199
RIM 850/950/857/957	Research in Motion	Built-In Wireless	\$399-\$499

Sources: Information is based on publicly available documents through the end of 2000 such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

Table 10: Bluetooth-Enabled Devices

<u>Company</u>	<u>Product Name</u>	<u>Product Type</u>
Ericsson	R520m/R520mc	Mobile phone
	Bluetooth Headset	Mobile phone accessory
Fujitsu	Lifebook C-6632, Lifebook B-2547, or FMV BIBLIO NE7/####	Mobile computers
	Bluetooth Wireless Modem Access Point	Computer accessory
IBM	Bluetooth PC-Card	Computer accessory
Motorola	Bluetooth PC-Card	Computer accessory
	Timeport 270	Mobile phone
NEC Corp.	Bluetooth Printer Adaptor	Computer accessory
Siemens	Bluetooth MPI-Adapter	Mobile phone accessory
Sony	Notebook Computers PCG-1524 and PCG-3314	Mobile computers
Toshiba	Bluetooth PC-Card	Computer accessory
	Bluetooth Data Projector Kit	Office equipment
WIDCOMM	BlueConnect	Computer accessory
Xircom	RealPort 2 Bluetooth Adapter	Computer accessory

Sources: The information provided above is illustrative of the qualified Bluetooth-enabled devices available from equipment manufacturers and should not be considered an exhaustive list. Information is based on the Bluetooth Qualification web site:
 <<http://qualweb.opengroup.org/Template.cfm?LinkQualified=QualifiedProducts>>.

Table 11: Telemetry Services

<u>Company</u>	<u>Status</u>
Schlumberger	5 million wireless telemetry customers in North America connected as of February 2001.
Itron	Offers AMR exclusively; had shipped 17 million AMR units at YE 2000 (10 percent increase from YE 1999) to over 650 utilities.
Aeris's MicroBurst	Leases the control channel of cellular networks from cellular carriers covering 98 percent of United States. During 2000, Aeris signed agreements with the following telemetry providers: SupplyNet Communications for the inventory and logistics management of liquid and gas filled tanks (allows distributors to remotely monitor the storage conditions and content levels of tanks); Telemetry Technologies for mobile asset tracking, automatic meter reading, and petrochemical asset, tank, and generator monitoring; LoJack to pinpoint the locations of vehicles and provide motorists with services such as emergency roadside assistance, remote door unlock, and E911; and the DPL Group to provide telemetry services for DPL's vending machine and vehicle fleet monitoring devices.
Cellemetry Data Service	Operating unit of NumereX Technologies; leases capacity from cellular carriers covering 99 percent of U.S. cellular markets. Provides two-way, wireless data connectivity for a variety of machine-to-machine communications that remotely monitor, measure, or track fixed and mobile assets. Remote monitoring equipment manufacturer, OmniMetrix, uses Cellemetry network to provide Caterpillar with wireless remote status and location monitoring for its fixed and mobile generator sets. Cellemetry signed agreements with Advanced Monitoring & Control, Inc. to provide monitoring of natural gas transport pipelines, and with Eberwhite Data Technologies, Inc. to monitor various attributes of liquid and gas storage tanks.
WebLink Wireless Inc.	Its telemetry business unit, Wireless Control Systems, sells the use of its narrowband PCS spectrum for remote monitoring services; has contracts to deploy security alarm monitoring and HVAC control systems.
Motient	Offers telemetry services such as AMR, asset tracking, and vending machine monitoring.
Cingular Interactive	Resells network to telemetry providers, such as alarm, billboard sign, and vending machine monitoring companies. EverTrac, Inc., a joint venture of Computer Associates International, Inc. and United Microelectronics Corporation, will use Cingular Interactive network to send fleet vehicle data, such as fuel consumption, mileage and location, from vehicles to offices.
SkyTel Reflex Telemetry Services	Offers telemetry services for nearly any type of machine measurement system. Uses narrowband PCS spectrum, satellite backhaul, and CreaLink2 XT wireless data transceiver devices to monitor and transmit remote data for its customers. Data transfer speeds are 25.6 kbps.

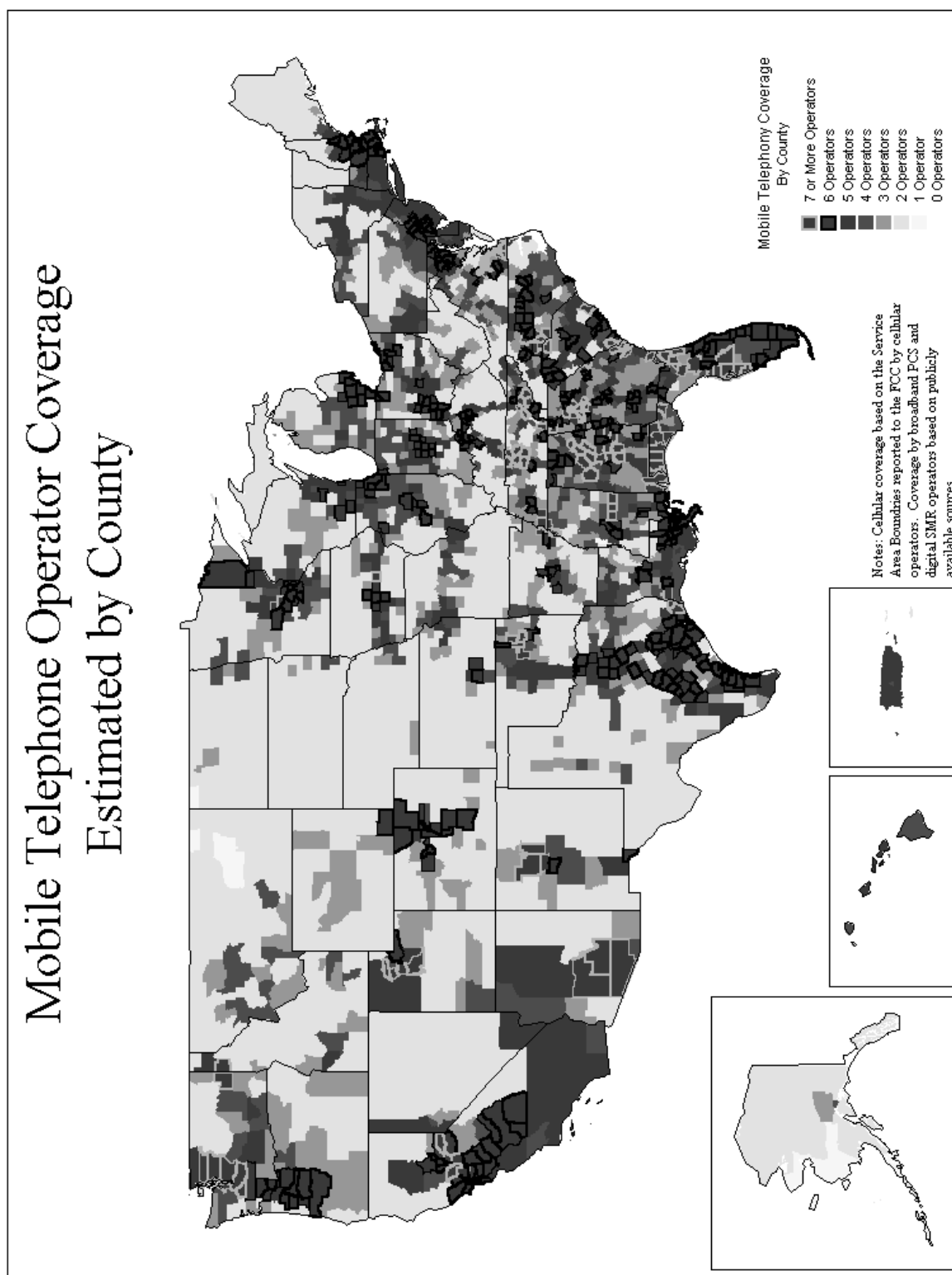
Sources: Information is based on publicly available documents such as news releases, newspaper and periodical articles, company web pages, and SEC filings.

APPENDIX E: MAPS

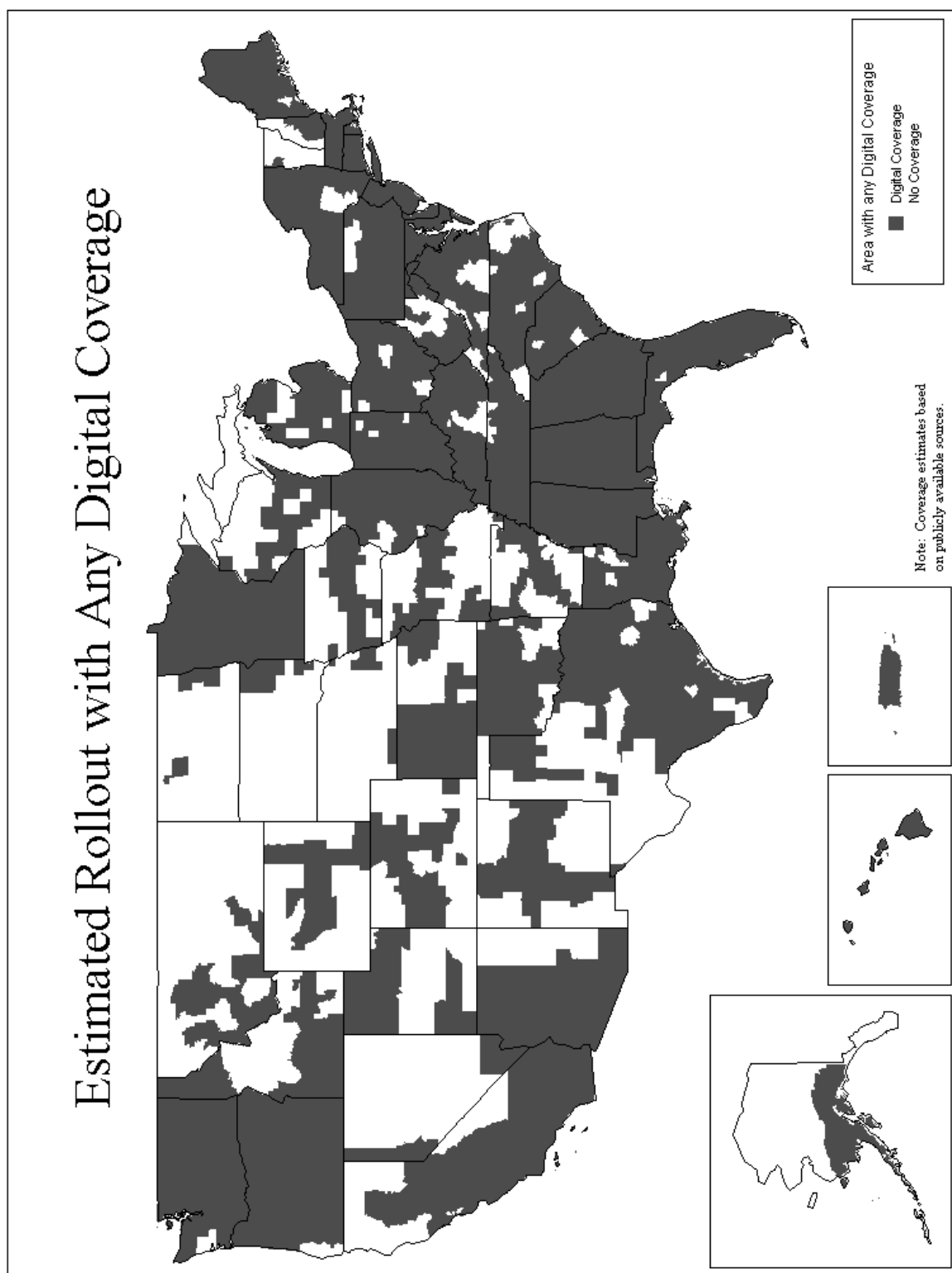
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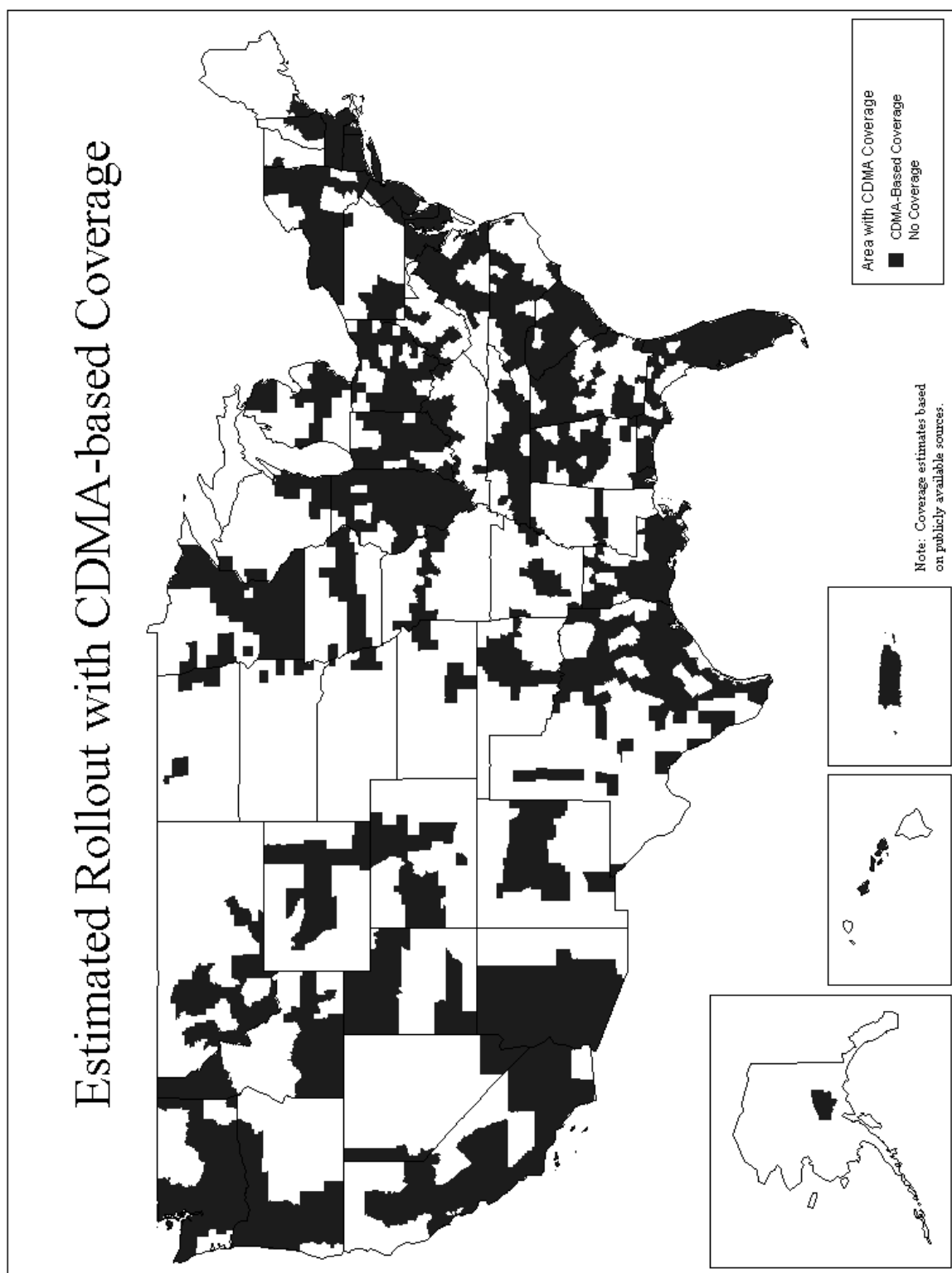
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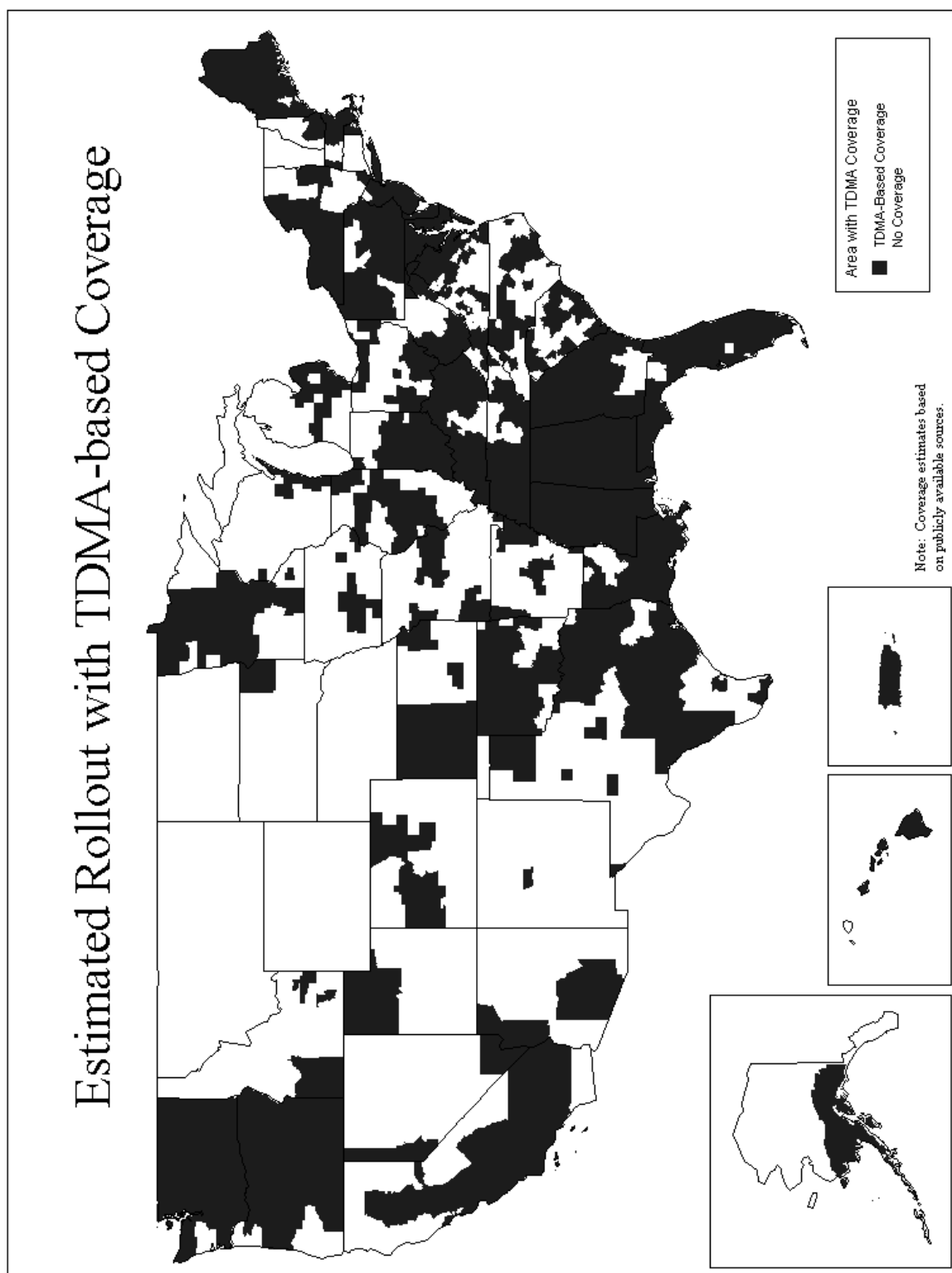
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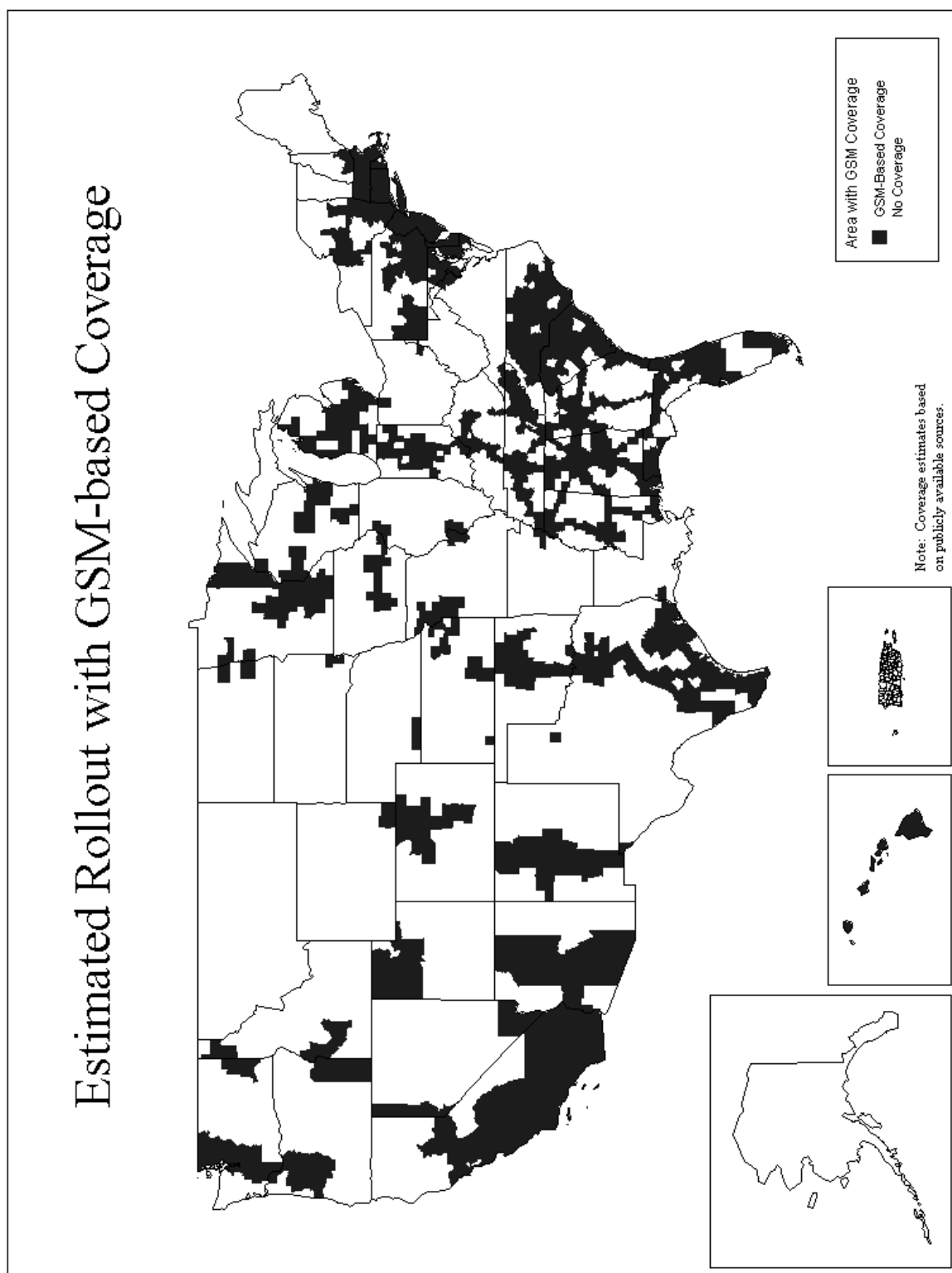
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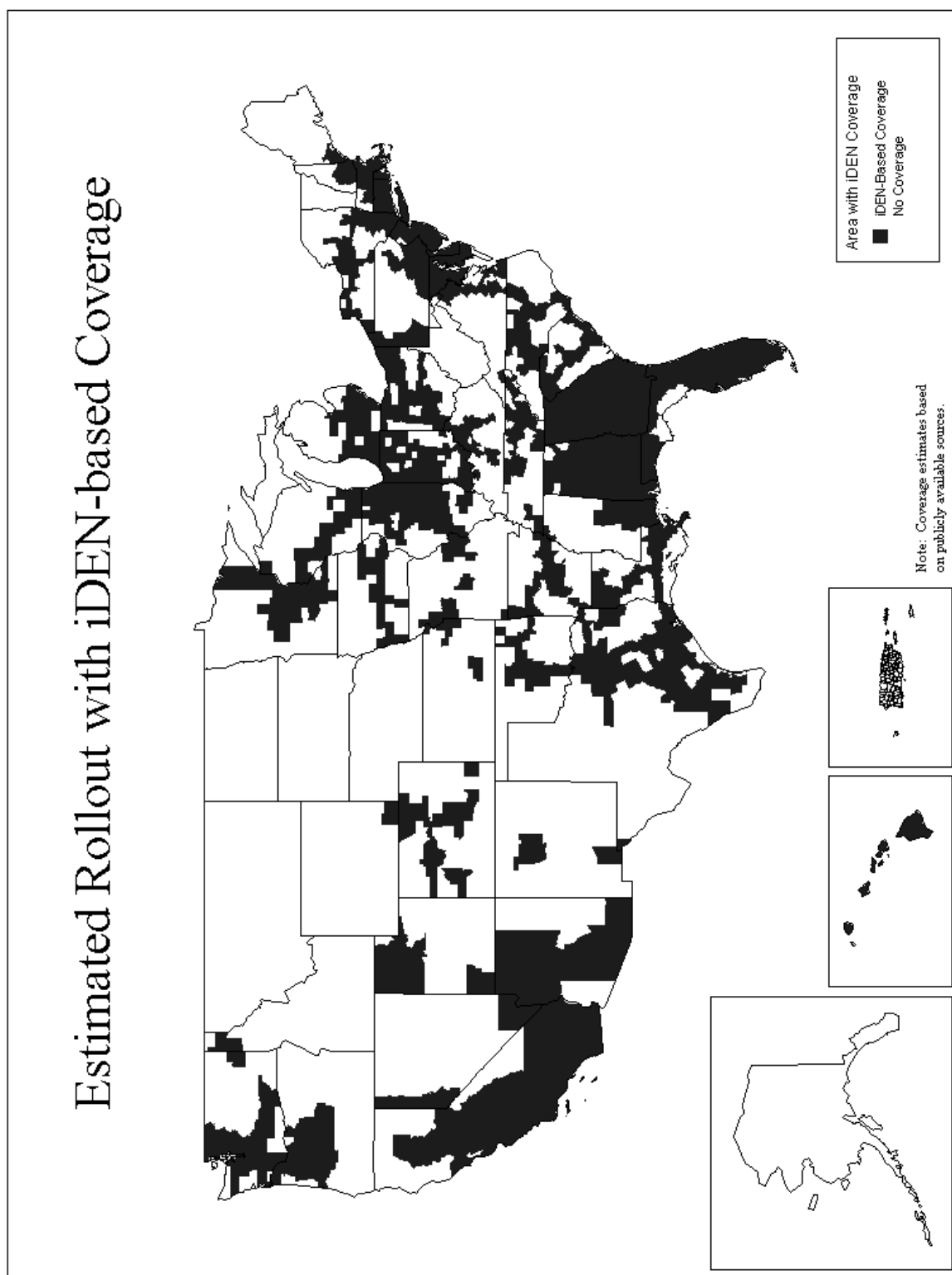
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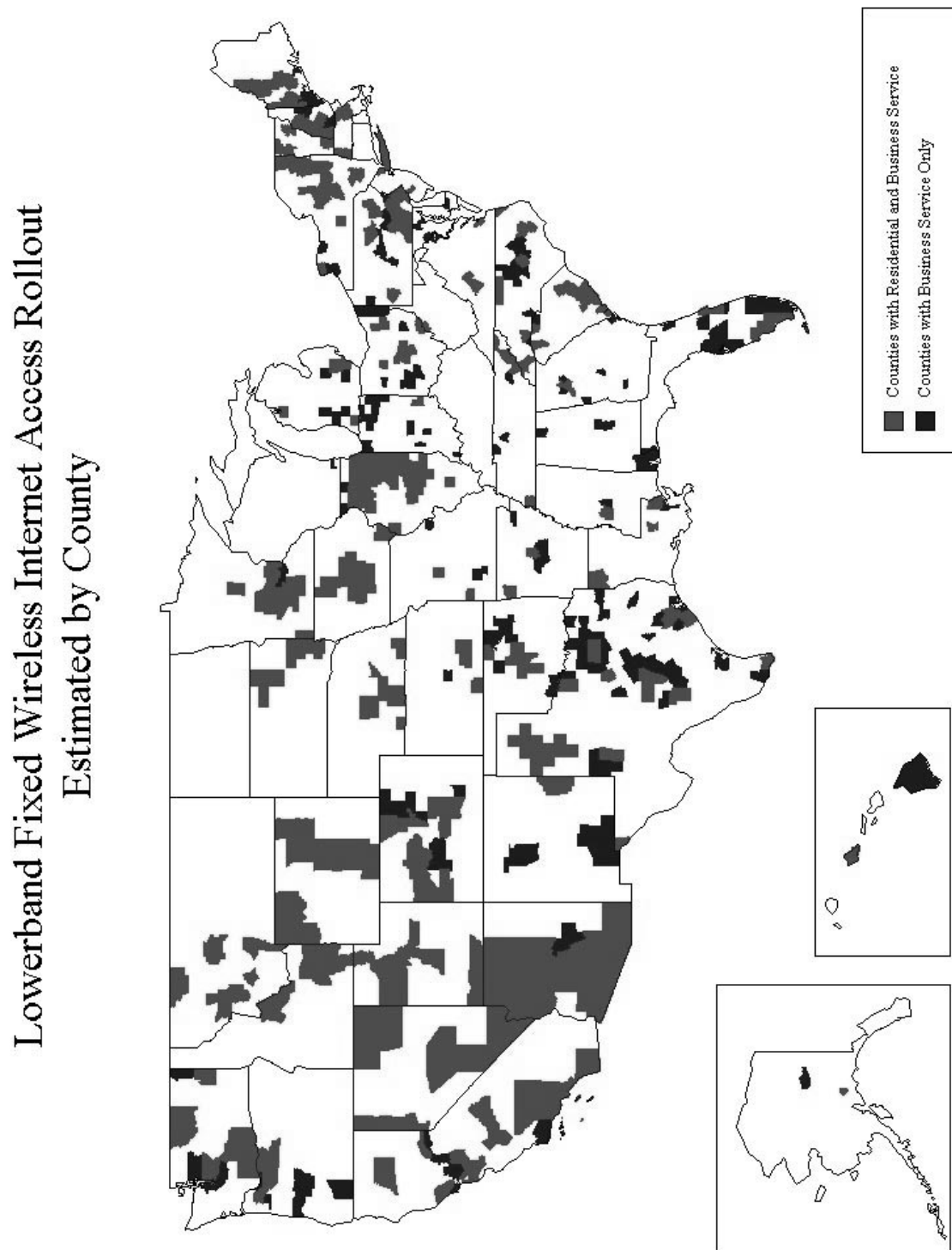
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Map 6

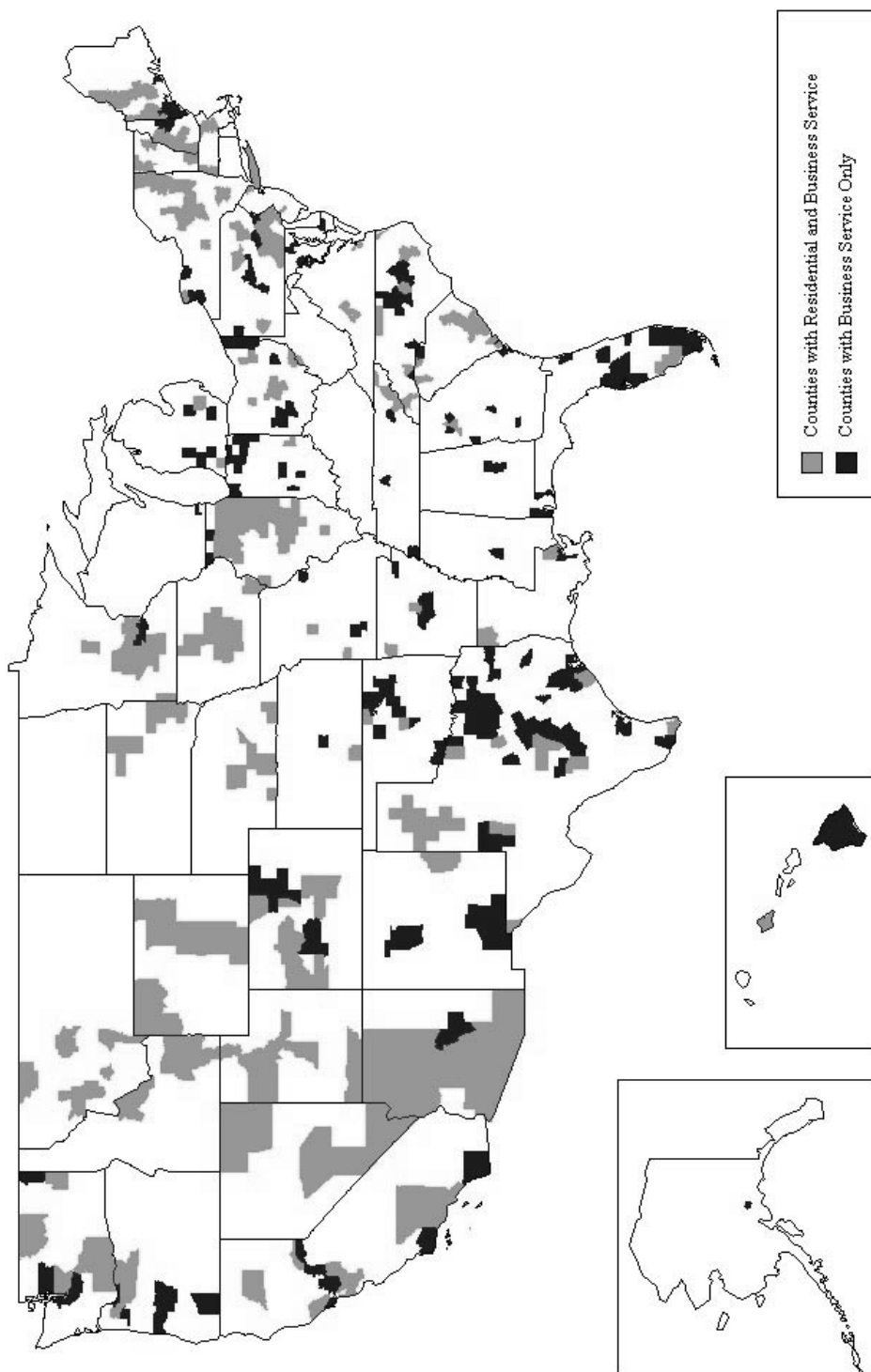


Map 7



Map 8

Rollout of Fixed Wireless Internet Access
via Unlicensed Spectrum Estimated by County



Map 9

U.S. Markets with Upperband Fixed Wireless Deployment

